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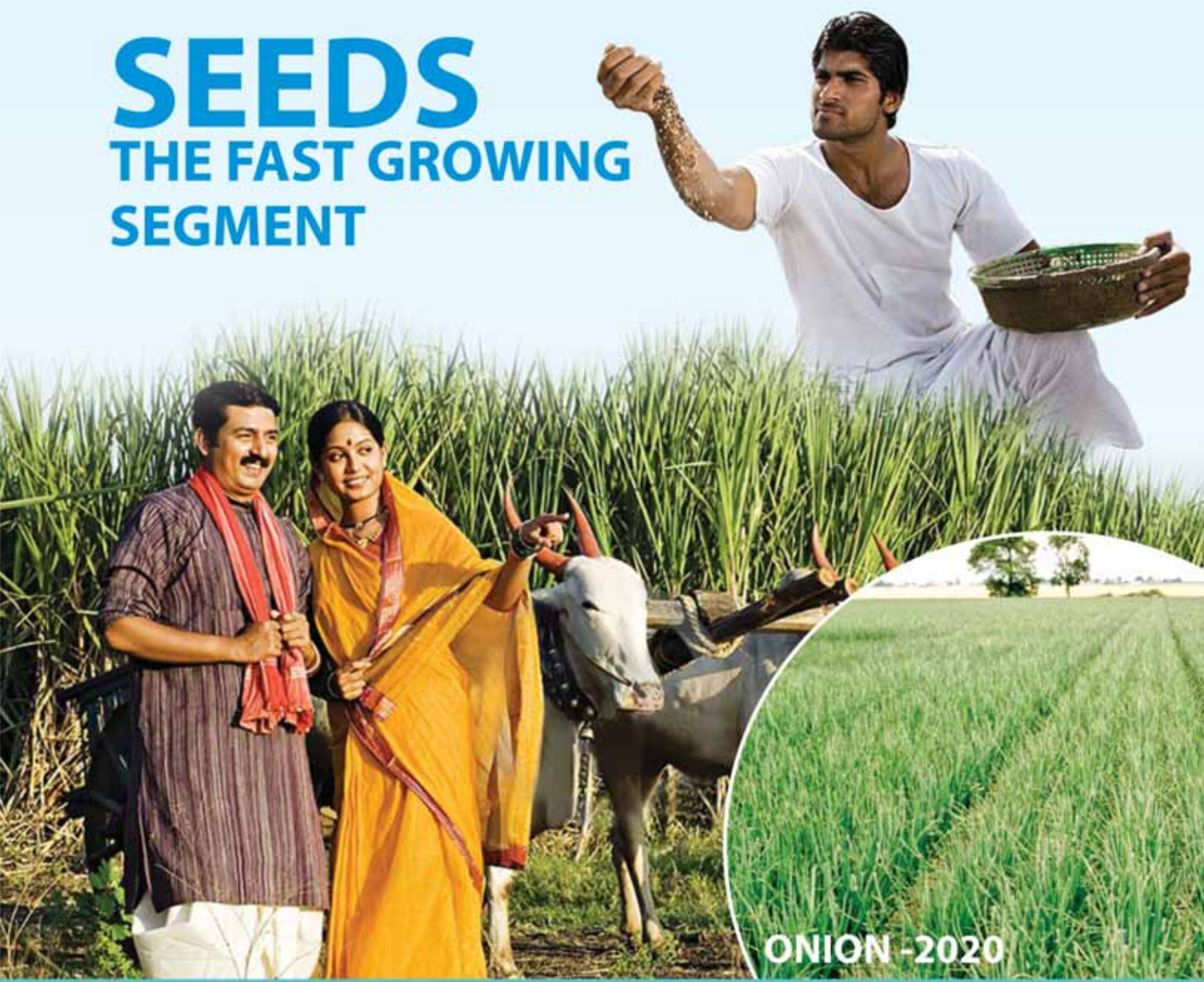
THE FAST GROWING SEGMENT



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EDITORIAL

Welcome to the October edition. The gross capital formation in India's agriculture sector as a proportion of agricultural GDP has gone up from 14.1 per cent in 2004-05 to 21.3 in 2008-09. It is good news for all stakeholders in agriculture.

The outlay for the agriculture and allied sector increased substantially from Rs.7, 431crore in 2006-07 to Rs.19,070 crore in 2010-11, an increase of about 156 percent. These figures were cited by Agriculture Minister Sharad Pawar while addressing the Economic Editors Conference in New Delhi, recently.

For States, the *Rashtriya Krishi Vikas Yojana (RKVY),* launched in August 2007 became the principal instrument for increasing investment in agriculture and allied sectors. Another important programme has been the National Food Security Mission (NFSM) launched in 2007-08 to enhance the production of rice, wheat and pulses by the end of the 11th Plan. The Mission also helped to widen the food basket of the country with significant contributions coming from the NFSM districts.

Despite these efforts, the 2010 Global Hunger Index (GHI) Report has ranked India abysmally at 67 among 84 countries. It was a reflection on the fact that higher growth rate of the Indian economy has not yet translated into hunger reduction. The GHI points to the high levels of child underweight, resulting from the low nutritional status of women in the country. This is certainly a matter of concern and the remedy lies in intense efforts to modernise agriculture.

According to the top brass of International Food Policy Research Institute (IFPRI) one percent farm growth can multiply poverty-reduction efforts two or three times. The report is an implicit invitation to act and bring in more reforms to the farm sector to raise productivity levels and address issues of food security and malnutrition.

In this context, the new proposal on higher regulation of micro finance companies needs a thumbs-up. The Central Government is reportedly working on a proposal to grant more supervisory powers to the National Bank for Agriculture and Rural Development (NABARD) to manage microfinance institutions (MFIs) in the country. Thus the Micro Financial Sector (Development and Regulation) Bill that may come up in the coming session of Parliament will bring all non-profit MFIs under the jurisdiction of NABARD.

Our cover story puts focus on Seeds sector and over all the content is a good mix of all important topics in agriculture. So read on…

A.K. Garg
Editor-in-Chief

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Trends of Investment Credit in Indian Agriculture

Decline in Investment Credit is a matter of Concern

By **A.N. Shukla*, P.P. Dubey** and S.K. Tewari*****

Reasonable level of Investment in agriculture sector is essential for capital formation to generate growth. Gross Capital formation in agriculture declined from 10.2 percent of GDP in 1999-2000 to 7.0 percent of GDP in 2006-07. The declining investment credit in agriculture in recent years has been a major cause of concern despite Government of India's efforts of doubling of credit flow to agriculture during the period 2004-05 to 2006-07. This calls for devising a conscious, implementable strategy for increasing investment in the agriculture sector. In the era of globalisation, when agriculture is expected to satisfy not only the domestic demand but is also expected to leverage on its comparative advantages and contribute substantially to foreign exchange earnings by way of exports, capital formation in agriculture is crucial. Hence, the need for increasing investment credit in agriculture is being felt as never before.

The growth in agricultural production depends upon a number of factors, of which improvement in crop production technology is one. The Green revolution, known for the use of high yielding varieties of seed and fertilisers, led to a shift in the production technology which was largely facilitated by investment in irrigation and land development. The technology and investment have together given the much needed food security and improved the resilience of the agricultural economy to a considerable extent. Investment in agriculture has two components-The component of Gross Fixed Capital Formation (GFCF), which includes primarily the investment in physical assets in agriculture; and the component of stocks in form of inventories which could be used for further production. The two components together constitute the Gross Capital Formation (GCF).

In the era of globalisation, when agriculture is expected to satisfy not only the domestic demand but also expected to leverage on its comparative advantages and contribute substantially to foreign exchange earnings by way of exports, adequate capital formation is essential to support modernisation of technology and management practices. Hence, the need for increasing investment in agriculture is being felt as never before. The paper examines the changing share of term credit (investment credit) advanced to agriculture by different institutional credit agencies i.e., Cooperatives, Scheduled Commercial Banks (SCBs) and Regional Rural banks (RRBs) and disparities across states in term credit flow on per hectare basis.

Materials and Methods

This article covers agricultural credit flow from cooperatives, scheduled commercial banks (SCBs) and regional rural banks (RRBs), which are the major planks of institutional agricultural credit system. The data was drawn from Report on Currency and Finance, RBI, and Economic Survey, 2008-09, GOI, Reserve Bank of India Bulletins, Statistical Tables Relating to Banks in India, Fertilizer Statistics, and Agricultural Statistics at a Glance.

Agency-wise flow of total agricultural credit as well as agency wise proportion of Short term and term credits in the total agricultural credit has been analysed for the post liberalisation period 1992-93 to 2005-06. Disparities across states in term credit flow on the per hectare basis were examined at two points of time i.e. 1985-86 (pre-liberalisation) and 1995-96 (post-liberalisation), the latest year for which data on term credit flow were available.

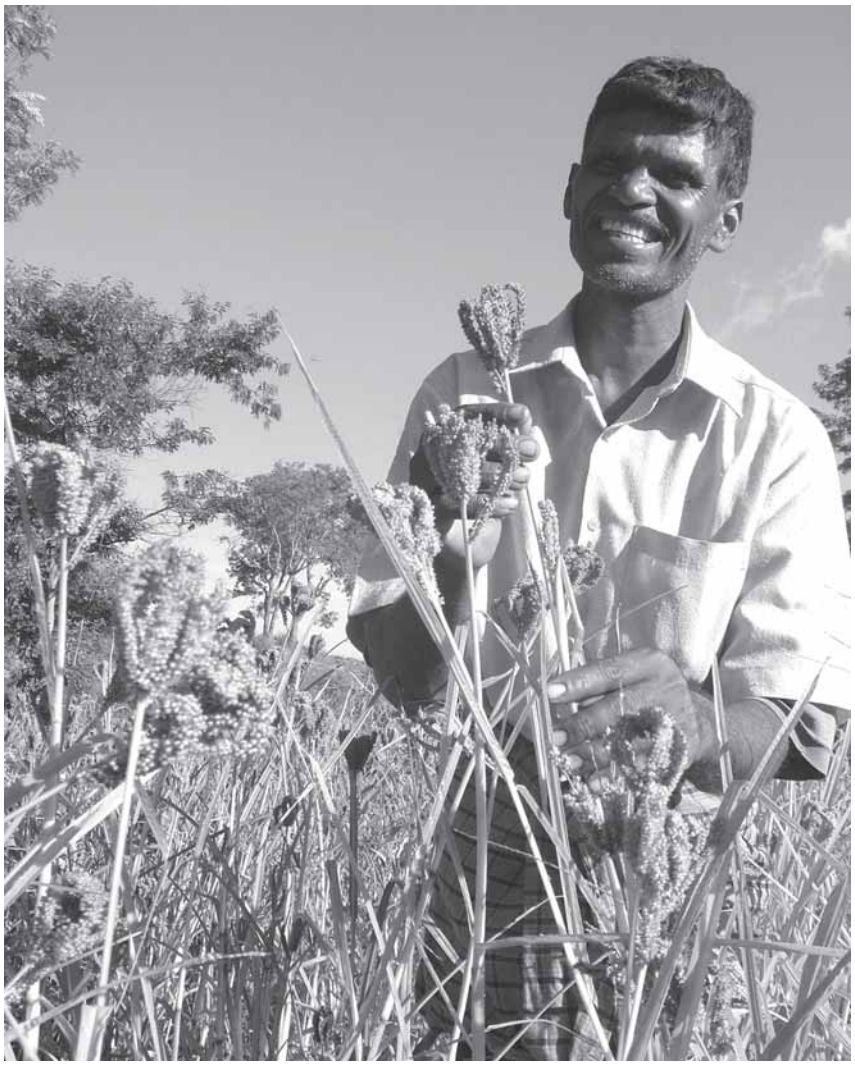
Cooperatives at the Front

Institutional funding of the farm sector is mainly by cooperatives, commercial banks, and regional rural banks. The agency-wise flow of institutional credit to agriculture is presented in Table I. It can be seen from the table that

cooperatives dominated the scene in agricultural credit flow till 1995-96 despite its share in credit supply declining from 61.8 percent in 1992-93 to 47.6 percent in 1995-96. Commercial bank credit over-took cooperatives in 1996-97 with its share in total agricultural credit consistently increasing from 48.4 percent in 1996-97 to 69.5 percent in 2005-06. Share of regional rural banks (RRBs) in total agricultural credit also increased consistently from 5.48 percent in 1992-93 to 8.43 percent in 2005-06. The total agricultural credit flow from all institutional agencies shot up to Rs. 180486 crore in the 2005-06 from Rs 15169 crore in 1992-93 after economic liberalisation policy launched in 1991-92.

The agency-wise share of short-term (ST) and medium and long term (MT/LT) credit flow to agriculture is presented in Table II. Within cooperative credit the share of term loan declined from 23.54 percent in 1992-93 to 11.36 percent in 2005-06. Within commercial bank credit, the share of term loan also declined in most of the years barring a few marginal upward turns over the 14 years period of 1992-93 to 2005-06. Within regional rural bank credit also the share of term loan consistently declined from 41.16 percent in 1992-93 and stood at 18.54 percent in 2005-06.

The term capital strictly implies building up of capital assets like pump sets, tractor etc. Therefore, the role of term credit (investment credit) becomes significant for capital formation in agriculture sector for raising the agricultural production and productivity. Farmers also require crop loan for a short term (production credit) to buy seed, fertilizer, payments of wages to labour etc. Both production and investment credit are essential for sustaining high agricultural growth in the economy. Awasthi (2007) showed in his study that the optimal range within which investment credit must vary should be between two-third (0.66) to three-fourth (0.75) of the production credit. However, the results in Table II indicate that investment credit (term credit) has been at less than 60 percent of production credit (short term) till 2003-04, with recovery in the proportion in 2004-05 and 2005-06 when renewed emphasis was given in enhancing agricultural credit flow. As a consequence, capital formation in agriculture has suffered and it is noted to be one of the reasons for slow rate of growth in agriculture and allied sector.



State-wise Flow of Term Credit to Agriculture

In the post-liberalistion period (1995-96), inter-state disparities in the flow of term credit to agriculture from commercial banks declined in comparison to the inter-state disparities in the pre-liberalisation period (1985-86) as is indicated by decline in coefficient of variation. Besides, there has been an impressive increase in per hectare flow of term credit over the decade (Table III).

In 1985-86, out of the seventeen states only six states had the per hectare flow of term credit from scheduled commercial banks above the national average. (Rs. 243.62) These states were Haryana, Punjab, Gujarat, Karnataka, Kerala and Tamil Nadu. The J&k, Assam and Orrisa had the term credit flow below Rs. 100 per hectare. The lowest per hectare term credit flow was in Assam (Rs. 0.94) and the highest was in Punjab (Rs. 616.63).

In 1995-96, the per hectare flow of term credit from Scheduled Commercial Banks was above Rs. 1000 in four states of Haryana, Punjab, Kerala and Tamil Nadu; between Rs 500 and Rs. 1000 in five states of Bihar, Uttar Pradesh, Gujarat, Andhra Pradesh and Karnataka; below Rs 500 and above Rs. 100 in seven states of Himachal Pradesh, J&K, Rajasthan, Orissa, West Bengal, Madhya Pradesh and Maharashtra. It was below Rs. 100 in Assam. The lowest per hectare term credit flow was in Assam (Rs. 17.82) and the highest was in Punjab (Rs. 1353.44),

Table: I. Agency-wise Flow of Credit to Agriculture (Rupees incrore)

Agency	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Cooperatives														
	9378 (61.82)	10117 (61.34)	9406 (50.18)	10479 (47.56)	11944 (45.22)	13975 (43.88)	15870 (43.17)	18260 (39.47)	20718 (39.28)	23524 (37.96)	23716 (34.09)	26959 (31.00)	31424 (25.07)	39786 (22.04)
Scheduled Commercial Banks														
	4960 (32.70)	5400 (32.74)	8255 (44.04)	10172 (46.17)	12783 (48.40)	15831 (49.71)	18443 (50.14)	24733 (53.46)	27807 (52.72)	33587 (54.21)	39774 (57.18)	52441 (60.29)	81481 (65.03)	125477 (69.52)
Regional Rural Banks (RRBs)														
	831 (5.48)	977 (5.92)	1083 (5.78)	1381 (6.27)	1684 (6.38)	2040 (6.41)	2460 (6.69)	3172 (6.87)	4219 (8.00)	4854 (7.83)	6070 (8.73)	7581 (8.71)	12404 (9.90)	15223 (8.44)
Total	**15169 (100)**	**16494 (100)**	**18744 (100)**	**22032 (100)**	**26411 (100)**	**31846 (100)**	**36773 (100)**	**46165 (100)**	**52744 (100)**	**61965 (100)**	**69560 (100)**	**86981 (100)**	**125309 (100)**	**180486 (100)**

Table: II. Agency-wise (short-term and term) Flow of Credit to Agriculture

Agency	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Cooperatives														
Short term (Production Credit)	7170 (76.46)	7839 (77.48)	7250 (77.08)	8331 (79.50)	9328 (78.10)	10877 (77.83)	12514 (78.85)	14771 (80.89)	16528 (79.78)	18787 (79.86)	19734 (83.21)	21438 (79.52)	23244 (73.97)	35266 (88.64)
Med/Long term (Investment Credit)	2208 (23.54)	2278 (22.52)	2156 (22.92)	2148 (20.50)	2616 (21.90)	3098 (22.17)	3356 (21.15)	3489 (19.11)	4190 (20.22)	4737 (20.14)	3982 (16.79)	5521 (20.48)	8180 (26.03)	4520 (11.36)
Total	9378 (100)	10117 (100)	9406 (100)	10479 (100)	11944 (100)	13975 (100)	15870 (100)	18260 (100)	20718 (100)	23524 (100)	23716 (100)	26959 (100)	31424 (100)	39786 (100)
Scheduled Commercial Banks														
Short term (Production Credit)	2432 (49.03)	2700 (50.00)	4087@ (49.51)	5345 (52.55)	6549 (51.23)	8349 (52.74)	9622 (52.17)	11697 (47.29)	13486 (48.50)	17904 (53.31)	21104 (53.06)	27988 (53.37)	42989 (52.76)	57640 (45.94)
Med/Long term (Investment Credit)	2528 (50.97)	2700 (50.00)	4168 (50.49)	4827 (47.45)	6234 (48.77)	7482 (47.26)	8821 (47.83)	13036 (52.71)	14321 (51.50)	15683 (46.69)	18670 (46.94)	24453 (46.63)	38492 (47.24)	67837 (54.06)
Total	4960 (100)	5400 (100)	8255 (100)	10172 (100)	12783 (100)	15831 (100)	18443 (100)	24733 (100)	27807 (100)	33587 (100)	39774 (100)	52441 (100)	81481 (100)	125477 (100)
Regional Rural Banks (RRBs)														
Short term (Production Credit)	489 (58.84)	732 (74.92)	688 (63.53)	849 (61.48)	1121 (66.57)	1396 (68.43)	1710 (69.51)	2423 (76.39)	3245 (76.91)	3777 (77.81)	4775 (78.67)	5835 (76.97)	9420 (75.94)	12401 (81.46)
Med/Long term (Investment Credit)	342 (41.16)	245 (25.08)	395 (36.47)	532 (38.52)	563 (33.43)	644 (31.57)	750 (30.49)	749 (23.61)	974 (23.09)	1077 (22.19)	1295 (21.33)	1746 (23.03)	2984 (24.06)	2822 (18.54)
Total	831 (100)	977 (100)	1083 (100)	1381 (100)	1684 (100)	2040 (100)	2460 (100)	3172 (100)	4219 (100)	4854 (100)	6070 (100)	7581 (100)	12404 (100)	15223 (100)
ST Total (Production Credit)	10091 (66.52)	11271 (68.33)	12025 (64.15)	14525 (65.93)	16998 (64.36)	20622 (64.76)	23846 (64.85)	28891 (62.58)	33259 (63.06)	40468 (65.31)	45613 (65.57)	55261 (63.53)	75653 (63.37)	105307 (58.35)
MT/LT Total (Investment Credit)	5078 (33.48)	5223 (31.67)	6719 (35.85)	7507 (34.07)	9413 (35.64)	11224 (35.24)	12927 (35.15)	17274 (37.42)	19485 (36.94)	21497 (34.69)	23947 (34.43)	31720 (36.47)	49656 (39.63)	75179 (41.65)
Grand Total (Prod. & Inv. Credit)	15169 (100)	16494 (100)	18744 (100)	22032 (100)	26411 (100)	31846 (100)	36773 (100)	46165 (100)	52744 (100)	61965 (100)	69560 (100)	86981 (100)	125309 (100)	180486 (100)
Ratio of Investment Credit to Production Credit	0.50	0.46	0.55	0.57	0.55	0.54	0.54	0.59	0.58	0.53	0.52	0.57	0.65	0.71

Table: III. State-Wise Per Hectare Flow of Commercial Bank Term Credit to Agriculture

States	1985-86 (Pre-liberalization Period)			1995-96 (Post-liberalization Period)		
	Total Term Credit (Rs. Thousand)	Gross Cropped Area (Thousand ha.)	Credit per hectare (Rs. Thousand)	Total Term Credit (Rs. Thousand) ha.)	Gross Cropped Area (Thousand	Credit per hectare (Rs. Thousand)
Northern Region	2019820	6580	258.59	4835500	7088.6	647.80
Haryana	2329300	5601	415.87	6053700	5974	1013.34
Himanchal Pradesh	127800	974	131.211	338100	972	347.84
J&K	94200	1030	91.45	174300	1073	162.44
Punjab	4413900	7158	616.63	10491900	7752	1353.44
Rajasthan	3133900	18137	172.79	7119500	19672	361.91
North-Eastern Region	3600	3794	0.949	70200	3938	17.83
Assam	3600	3794	0.949	70200	3938	17.82
Eastern Region	1580000	9254.33	172.35	4029167	9553	418.33
Bihar	2122200	10517	201.78	6642300	10019	662.97
Orissa	725600	9259	78.36	1855500	9668	191.92
West Bengal	1892200	7987	236.91	3589700	8972	400.10
Central Region	4670600	23998.5	192.74	12596200	25416.5	494.62
Madhya Pradesh	3382100	23016	146.94	10749000	25040	429.27
Uttar Pradesh	5959100	24981	238.54	14443400	25793	559.97
Western Region	3865650	15110	276.74	7950550	15704.5	519.79
Gujarat	3243500	9683	334.96	5621800	10082	557.60
Maharashtra	4487800	20537	218.52	10279300	21327	481.98
Southern Region	2377575	8232.75	314.17	6810675	8583.5	953.69
Andhra Pradesh	2643900	12100	218.50	6795200	13043	520.98
Karnataka	3365100	11146	301.91	8248100	11958	689.75
Kerala	1101600	2866	384.36	3946400	3066	1287.14
Tamil Nadu	2399700	6819	351.91	8253000	6267	1316.89
All India	41425500	175605	243.62	104671700	184616	609.14
Coefficient of Variation (%)			164.36			149.82

@ Projected by authors
Source: Report of the task force on revival of short-term cooperative credit structure, Feb. 2005, GOI, Economic Survey 2008-09, GOI.
Note: Grand total also includes credit from other agencies.

similar to the position as noticed in 1985-86. Only six states namely Haryana, Punjab, Bihar, Karnataka, Kerala and Tamil Nadu experienced term credit flow above the All India average. This position is similar to that in 1985-86 except Gujarat getting replaced by Bihar.

Impact of Liberalization

The above results reveal that liberalisation policy produced desirable effect of reducing inter-state disparities in the flow of term credit per hectare from Scheduled Commercial Banks. However, despite increase in term credit flow and reduction in inter-state disparities therein, the ratio of production to investment credit continues to remain below the desired level (1: 0.66 to 0.75). Therefore, requisite measures need to be taken by scheduled commercial banks for enhancing the flow of term credit to agriculture.

Suggestion for Increasing Investment Credit

The National Agriculture Policy adopted in July 2000 had envisaged an annual growth in agriculture of over 4 percent per annum and highlighted adequate and timely supply of institutional credit to farmers. Total credit flow to agriculture and allied sectors during the Tenth Five Year Plan period was projected at Rs.7,36,570 crore, viz. Rs.3,59,701 crore (48.8 %) short-term credit and Rs.3,76,869 crore (51.2 %) term credit. The ground level institutional credit to agriculture doubled in 2006-07 over 2003-04 and reached the level of rupees 229,400 crore. The credit flow is expected to reach Rs. 264,455 crore in 2009-10 against the target of Rs. 325,000 crore.

There is no doubt about the continued importance of short-term credit which accounts for little less than two third of the total institutional lending to agriculture. However, there is a dire need for raising investment credit to meet the growing needs of infrastructure such as transport, storage, processing, marketing, quality testing etc. for modernising agriculture. Otherwise, Indian agriculture may continue to face intermittent periods of crises and agricultural growth may continue to remain depressed.

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SEEDS
The Fast Growing Segment

By **G. Kalyan Kumar***

The Indian seed industry is the 8th largest in the world with an estimated value of Rs 49 billion or US$ 1.06 billion. It is growing at an annual growth rate of 12 percent. The Government of India established the National Seeds Corporation in 1963 and the State Farming Corporations of India in 1969 to encourage production and distribution of certified seeds of various Indian crops. There are thirteen state seed corporations arranging production and distribution of certified seeds.

National Seeds Project

The National Seeds Project (NSP) was undertaken by the Indian Government in 1967 along with the assistance of the World Bank.

While the NSP did set up huge seed processing plants in order to provide 'certified'. While the NSP did set up huge seed processing plants in order to provide 'certified' seeds of food crops, mainly self-pollinating to farmers, most of these plants operated well below capacity and were stated to be examples of 'faulty technology being pushed into India'.

Legislation on Seeds in Indian agriculture is governed by nearly thirty legislations. Some of them are the Seeds Act 1966; the Essential Commodities Act, 1955; the Biological Diversity Act, 2002; Plant Varieties Protection and Farmers' Rights Act, 2001; Patents Amendment Act, 2005; Environment Protection Act, 1986; Consumer Protection Act, 1986; Geographical Indication of Goods Act, 1999; The Plants, Fruits and Seeds (Regulation of Import into India) Order, 1989 etc.

The National Seed Plan was aimed at ensuring seed replacement rate of 25 percent for self-pollinated crops, 35 percent for cross-pollinated crops and 100 percent for hybrids for achieving higher productivity.

Fragmented Market

The private sector in the seed industry is highly fragmented with an estimated 300 players and the top 10 companies account for 25 percent of the total volume. An estimated 250 companies operate as trading firms and these generate an average turnover of Rs 5 crore annually.

The commercial seed market accounts for 25 percent of the total market potential and the remaining 75 percent is dominated by vareital seeds that farmers retain from prominent food and commercial crops. The public sector, led by National Seeds Corporation Ltd and 13 other State seed corporations, supplies high volume and low value seeds

of improved varieties of cereals, pulses and oilseeds, the outlook said.

A buffer stock of seeds is maintained by the National Seeds Corporation for the northeastern states and by the State Farm Corporations of India for the other states against such unforeseen contingencies as floods and droughts.

The industry has shown a buoyant growth over the last two years on good monsoons. Nearly 70 percent of India's seeds' sales come from farmer bred seeds, 26 percent from those bred in publicly funded institutions, and only 4 percent from researched hybrids.

Role of Private Sector

Variety development (especially for self-pollinated crops) is predominantly carried out in the public sector, although in recent years there is growing private sector involvement, which focuses mainly on hybrid cereals, cotton, sunflower, vegetables, and flowers. The private sector is also actively involved in developing bio-engineered crops of cotton, oilseeds, and other crops. The ICAR, operating through 30 All India Coordinated Crop

Improvement Projects (AICCIPs), five Crop Directorates, and seven National Research Centres coordinates public sector plant breeding. Basic genetic material from which new varieties are developed is available from the institutions' own resources and from the National Bureau of Plant Genetic Resources (NBPGR), through which India has established a working relationship with international agricultural research centers.

Hybrid Seeds

The domestic hybrid seeds market is growing annually at 10 percent a year, against the 5 percent global growth rate. Players like Monsanto India and Syngenta India dominate the hybrid seed market. The Indian market works out to about 3.7 percent of the global market.

The seed industry is the backbone of the massive multi-billion fruit and vegetable industry. In the interior regions farmers are busy gauging the possible benefits of shifting to the branded, value-added hybrid seeds which give better prices and higher yields in relatively shorter span of their cropping activities.

Says an analyst, "the change is palpable in parts of Western Maharashtra, Karnataka, Gujarat, South Rajasthan, Andhra Pradesh, Tamil Nadu where farmers prefer branded seeds, the Northern and the Eastern regions are yet to shift".

An agri analyst said, "Most of the MNCs are willing to invest in technology and offer advanced products while passing the benefits to the farmer in the form of higher yields and the better prices."

The changing pattern, in the retail food industry, has prompted the farmers to increase seed replacement rates in India for crops. Around 10-12 percent of the normal seeds market has already shifted to the hybrid seeds or valued-added seeds, industry sources said.

Seed Policy

In 1988, National Seed Policy was framed that involved a US$150 million loan from the World Bank to privatise the Indian Seed Industry. At this time, the import of seeds was still restricted but this sector was gradually opened up, to allow more private participation.

Further, India signed the GATT agreement and joined the WTO and these agreements made India obligatory to make some changes in its laws, especially regarding Intellectual Property Rights. These requirements were met through the Protection for Plant Variety and Farmers' Rights Act, 2001. In 2002, a new National Seed Policy was released, to meet the goals of this policy the new Seed Bill was drafted and tabled in Parliament in 2004.

The objective of the new seed policy was to reduce the direct involvement of government in seed production and marketing, and to actively encourage the private sector to engage in research and development of new varieties. The dominance of the public sector was blamed for the backwardness of Indian agriculture, and one of the stated aims of the National Seed Policy, 2002 was to encourage more private participation in agriculture and seed production, specifically, to complement the existing structures and to replace them, if necessary.

NSP 2002

The government approved a new National Seeds Policy in 2002 to provide intellectual property protection to new varieties and set up institutes for the planned development of the sector as vital instruments in attaining the objectives of doubling food production and making India hunger free.

The National Seed Policy, 2002 clearly identified the twin aims of encouraging the seed industry, especially the domestic industry and of ensuring maximum prosperity and security for farmers. A number of the National Seed Policy's

recommendations have been addressed in the Protection of Plant Varieties and Farmers' Rights Act, 2002, including the establishment of a National Gene Fund and a Plant Varieties' authority.

The aims of the National Seed Policy include building up infrastructure, ensuring good quality of seeds and facilitating international trade in seeds. At the very outset, the preamble of the bill makes clear its intention. The Bill intends to "provide for regulating the quality of seeds for sale, import and export and to facilitate production and supply of seeds of quality and for matters connected therewith or incidental thereto".

A need was felt for using new techniques and methods to increase the productivity of Indian agriculture. At the same time the Bio-Technology sector came up with promises of extremely productive Genetically Modified (GM) Crops. These new scientifically manipulated crops caught the imagination of the Indian Government and farmers as well.

Consolidating Market

However, increasing international competition, R&D costs, and the complexity of biotechnology have led to higher consolidation of the Indian seed industry with several of the large and medium companies merging or being taken over by multinational seed companies.

Most large multinational seed companies now have their presence in India (either as a joint venture or with 100 percent equity) with their main focus on biotechnology. These include Monsanto, Bayer CropScience, Syngenta, Advanta, Hicks-Muse-Tate, Emergent Genetics, Dow Agro, Bioseed Genetics International Inc, Tokita Seed Co, and Nunhems Zaden BV.

The initial focus of many of these companies has been cottonseed, for which genetically modified (Bt) hybrids have already been approved by the Indian government for commercial cultivation, with many other bio-engineered crops in the pipeline.

Criticism on MNC Dominance

There is criticism that India's adoption of neo-liberal policies has lessened the sovereignty of rural India. TRIPs in particular have created a gateway for agro-business conglomerates to engage GM seed monopolisation and marginalise rural communities.

Critics say that centuries of indigenous knowledge, traditional cultivation practices and sharing techniques are being compromised. And many farmers

Production / Availability Of Certified/Quality Seed

Qty. In Million Tonnes

	X Plan period					XI Plan	
CROP	**2002-03**	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**
WHEAT	0.3150	0.3653	0.4783	0.4001	0.4568	0.6700	0.8768
PADDY	0.2921	0.3228	0.3156	0.367	0.4035	0.5354	0.6654
MAIZE	0.0455	0.1025	0.0815	0.0886	0.0808	0.0553	0.0740
JOWAR	0.0366	0.039	0.0352	0.0411	0.0348	0.0278	0.0274
BAJRA	0.0263	0.0347	0.0284	0.0349	0.0243	0.0244	0.0261
RAGI	0.0025	0.0027	0.0027	0.0026	0.0028	0.003	0.0036
BARLEY	0.0052	0.0062	0.0071	0.0054	0.0072	0.0241	0.0231
CEREAL TOTAL	**0.7232**	**0.8732**	**0.9488**	**0.9397**	**1.0101**	**1.3400**	**1.6964**
GRAM	0.0245	0.0258	0.0327	0.0296	0.057	0.0608	0.0835
LENTIL	0.0031	0.0043	0.0047	0.0041	0.0026	0.0063	0.0059
PEAS	0.0036	0.0062	0.0065	0.0034	0.0044	0.0115	0.0130
URD	0.0134	0.0165	0.0138	0.0207	0.0146	0.0179	0.0314
MOONG	0.0096	0.0094	0.0114	0.019	0.0163	0.0169	0.0248
ARHAR	0.0086	0.0086	0.0085	0.0099	0.0119	0.0167	0.0175
COWPEA	0.0012	0.0009	0.001	0.0011	0.0013	0.0017	0.0024
MOTH	0.0003	0.0002	0.0004	0.0006	0.0006	0.0006	0.0020
OTHERS	0.0003	0.0002	0.0002	0.0003	0.0013	0.0018	0.0026
PULSES TOTAL	**0.0646**	**0.721**	**0.0792**	**0.0887**	**0.1101**	**0.1341**	**0.1830**
GROUNDNUT	0.0730	0.101	0.0682	0.1119	0.1114	0.1762	0.3187
RAPE/MUST.	0.0105	0.0108	0.0164	0.016	0.0197	0.0196	0.0207
TIL	0.0022	0.0017	0.0018	0.0023	0.0021	0.002	0.0028
SUNFLOWER	0.0107	0.0118	0.0103	0.0133	0.0102	0.0111	0.0059
SOYABEAN	0.0662	0.0952	0.1181	0.1478	0.1348	0.1691	0.1801
LINSEED	0.0001	0.0002	0.0001	0.0001	0.0002	0.0003	0.0003
CASTOR	0.0044	0.0051	0.0045	0.0056	0.0063	0.0056	0.0056
SAFFLOWER	0.0010	0.0012	0.001	0.0013	0.0008	0.0009	0.0007
NIGER/others		0	0.0003	0	0.0006	0.0002	0.0001
OILSEEDS TOTAL	**0.1681**	**0.227**	**0.2207**	**0.2983**	**0.2861**	**0.3851**	**0.5350**
COTTON	0.0367	0.0307	0.0301	0.0288	0.0256	0.0261	0.0272
JUTE	0.002	0.0022	0.002	0.0052	0.0037	0.008	0.0042
MESTA/OTHER	0.005	0.0001	0.0001	0.0002	0.0006	0.0018	0.0047
FIBRE TOTAL	0.0437	0.033	0.0322	0.0342	0.0299	0.0358	0.0361
POTATO	0.038	0.037	0.0397	0.0417	0.0415	0.0435	0.0430
OTHERS	0.002	0.0015	0.0021	0.0025	0.0041	0.0047	0.0100
GRAND TOTAL	**1.0396**	**1.2438**	**1.3227**	**1.4051**	**1.4818**	**1.9431**	**2.5035**

(Source: compiled by Seeds Division of DAC)

India has the potential to become a hub of seed production for South-East Asian region and can be a supply source to African countries, Rabobank International said in a study

have lost their right to cultivate and control the agricultural production cycle. As a result, farmers increasingly find themselves in debt and disempowered.

The decision taken by the Indian government with the introduction of the Seed Bill 2004 provided tightened the control of the seeds sector to the multinational corporations. Critics say provisions like compulsory seed registration give the MNCs control over Indian seeds. They charge that a monopolistic patent regime and corporate monopoly over seeds can be harmful as long as farmers have the alternative of their own zero cost, reliable, time tested high value seeds of their traditional varieties of indigenous agro-biodiversity.

Exports

The Seeds Act, 1966 provides for the legislative framework for regulation of quality of seeds sold in the country. In order to encourage export of seeds in the interest of farmers, the procedure for export of seeds has been simplified. Seeds of various crops have been placed under Open General Licence (OGL) except the seeds of wild varieties, germ plasms, breeder seeds, and onion seeds which are on restricted list under the Export and Import Policy 2002-07.

India as a Hub

India has the potential to become a hub of seed production for South-East Asian region and can be a supply source to African countries, Rabobank International said in a study.

"The case for India emerging as a production hub is backed by the fact that the country has built up sufficient expertise and resources in both the private and public domain to become a

Role of Public & Private Seed Sector

Year of Production	Total Seed Production (Lakh qtls.)	Share of private sector
2003-04	132.27	47.48%
2004-05	140.51	45.02%
2005-06	148.18	46.80%
2006-07	194.31	41.00%

(Source : compiled by Seeds Division of DAC)

Seeds Research

wider use of proprietary hybrids, increased farmer awareness of new methods and introduction of technologically advanced products that offer improved biotic and abiotic traits.

Stating that seed companies were currently spending around five percent of their turnover on research and development, the outlook said the firms are expected to churn out more products with shorter life cycles in the future. "This will keep R&D costs a high level. Companies may decide to work in alliance with biotech companies for R&D of new products," it said.

The bottom line is—India's seed industry is heading for exciting times.

**The Writer is Editor of Financing Agriculture*

strong ally in early stage contract research or late stage seed multiplication," the bank said in a market overview and outlook on Indian seed industry.

The study stated germplasm and varietal traits as key determinants of product performance. "After cotton, hybrid rice, mustard and soyabean will be the crops to drive industry growth," the outlook said.

An increase in replacement ration could give depth to the industry and it would help increase the size of seed sector and volumes in the mass market segment. "Development, higher penetration and renewed focus are anticipated in states including Bihar, Uttar Pradesh, Madhya Pradesh and Orissa," the study said.

Even if the Indian market reaches a point of saturation, the neighbouring markets such as Pakistan, Bangladesh, Sri Lanka, Thailand and Malaysia could become attractive destinations for export of seed for crops, including cotton, sunflower, sorghum, pearl millet and vegetables. "Access to these markets could help sustain the growth of Indian seed companies," the bank said.

Outlook

The seed sector will be a major driver of agriculture sector in the country to realise future growth due to increased seed replacement rate, higher conversion,

Major Government Initiatives in Seed Sector

- Enactment of the Seeds Act (1966)
- Seed Review Team-SRT (1968)
- National Commission on Agriculture's Seed Group (1972)
- National Seeds Programme (1975-85)
- Seed Control Order (1983)
- Technology Mission on Oilseeds & Pulses (1986)
- Production and Distribution Subsidy
- Seed Transport Subsidy Scheme (1987)
- New Policy on Seed Development (1988)
- Seed Bank Scheme (2000)
- National Seeds Policy (2002)
- The Seeds Bill (2004)
- Formulation of National Seed Plan (2005)
- National Food Security Mission (2007)

National Seeds Policy, 2002

- Variety development
- Plant variety protection
- Seed production
- Quality assurance
- Seed distribution and marketing
- Infrastructure facilities
- Transgenic plant varieties
- Import of seeds and planting materials
- Seed exports
- Promotion of domestic private sector seed industry
- Strengthening of the monitoring system

Seeds Bill, 2004

- Registration of kinds and varieties of Seeds etc.
- Evaluation of performance
- Compensation to Framers
- Registration of Seed Producers and Processing Units
- Seed dealers Registration
- Regulation of Sale of Seed and Seed Certification
- Seed Analysis and Seed Testing
- Export and Import of Seeds and Planting Material
- Offences and Punishment.

ONION – 2020

Higher Volumes of Production and Better Quality Standards in Sight

Time to Adopt New Farming Technologies

By **Dr. S.R. Bhonde***

Onion is cultivated in India as one of the important vegetables and spice crops. With Its prime place in the daily diet of Indians, Onion is consumed by both vegetarian and non-vegetarian population in both processed as well as fresh forms. The rising demand for Onion coming from the increasing population has warranted higher production volumes and application of new methods to increase productivity. There is also need to improve the availability of onions through reduction in post harvest losses and increased storage capacity to cater to the needs for regulating the supply throughout the year.

The changing climate in the last few years has impacted the onion crop both at the productivity and quality fronts. India is the second largest country in growing onion, after China. However, average productivity is still low due to many reasons including the varieties used under tropical and sub-tropical conditions and short day conditions.

Export Potential

Export of onions from India both in fresh and processed forms is increasing. The sharp increase in export of onions during past two years has shown increased global demand for Indian onion. The demand for White onion is increasing at the export markets. In order to meet the raw material requirement for processed onions, there is need to increase the production of onion for processing as well.

To map the scenario of Onion 2010, the challenges emanating from limited resources, increased labour problem, cost of production, disease and pest infestation, abiotic stress, changed food habits and influence of various factors are to be reckoned with.

Cultivated Area

As per the estimates, the present production of onion is about 95 – 100 lakh MT from over 7 lakh hectare cultivated area. After the onion crisis in 1998-99, the crop received much attention from the Government and various schemes were initiated to strengthen the development of this crop, as a result there has been substantial increase in the area under production. The production has increased from 35 lakh tonnes to about 100 lakh tonnes showing an average increase of 10

percent per annum.

The storage also increased considerably but productivity could not be increased to the desired level. Keeping in view the increased requirement as observed in the past few years coupled with limitations on resources, more attention is required to improve the quality, quantity and productivity. Even if we consider 5 percent increase per annum in the production of onion, during 2020, it should be at least 165 lakh MT. To achieve this, the crop management and application of improved technology apart from use of improved varieties and hybrids have to be seriously considered.

Role of Maharashtra

Since Maharashtra is a leading state, growing onion with tremendous progress achieved in adoption of technology and adequate market exposure and storage facilities there is further scope for development of onion in the state. In Gujarat the impact of leveled soils, available capital for crop management and proper use of farm manures and organic manures along with chemicals, fertilisers for growing onion crop have helped the Gujarat farmers.

In Maharashtra, the area under onion cultivation is fast increasing in districts like Ahmednagar where onion has proved to be a good rotation crop for sugarcane. The State Government along with Maharashtra State Agricultural Marketing Board has been encouraging farmers to adopt micro irrigation technology and increase storage capacity through provisions of financial assistance.

Increased storage capacity with the farmers in rural areas has proved to be a boon in maintaining the price level apart from increased exports. For increased exports, a significant role has been played by NHRDF through technical guidance and services to farmers as well as exporters.

Intercropping

The new pockets having potential for onion cultivation are to be developed in the coming years to eliminate problems of low productivity and high disease infestation. The pockets having better irrigation facilities can be brought under onion cultivation to replace the areas under traditional cultivation for a few years. The introduction of intercropping and crop rotation techniques particularly with crops which can help onion such as leguminous crop and other vegetable crops can be tried. It can also be experimented with newly planted orchards as well as wide spaced crops and long duration crops like sugarcane, chilli and even cotton can be considered for better utilisation of cultivable land with limited resources. Thus in the coming years, despite limited scope, expansion of area under onion can be increased by adopting innovative practices on a large scale.

Demand Projection

If we consider the consumption of onion at 25 gm per day per capita and presume that 65 percent of population consume onions and export goes to the tune of 20 lakh MT with increase of 5 percent every year and loss in handling and storage etc as 12 percent and bulb required for use for seed production and for processing industry with increased requirement for 2020 the quantity would be required to the tune of proposed production level of 165 lakh MT during 2020 from estimated current 100 lakh MT. It may also to be considered that variation in this level may have direct effect on price trend and thus need to be watched very carefully.

Climatic Changes

Changing temperature, rainfall pattern, increased soil temperature, shortened winter and abrupt changes in temperature affect onion crop and the development of bulbs as well as its quality. To meet the onion requirements of 2020, the development of varieties that are tolerant to abiotic stress, varieties of short maturity, changed planting systems, efficient use of water and nutrients, more use of organic nutrients, new practices to sustain moisture stress etc. are important. Technologies are to

Seed Crop

be standardised for different areas for adoption to maintain production level without affecting the quality. This can be achieved by intensified awareness programmes through NHRDF and also with the help of NGOs and Self Help Groups.

Quality Seed

Seed is a basic input and many diseases are likely to be transmitted through seeds. In onion, although seed borne diseases are not affecting the crop presently, the increasing incidence of Irish yellow spot virus may pose a threat to onion as it appeared first in seed crop and is reporting in bulb crop in many parts of the country.

This is alarming as steps are to be taken in a strategic manner to check the disease in order to maintain the level of seed and bulb production through adoption of appropriate plant protection measures.

The seed production is also a technical process and seed development as well as seed quality depends on several factors, there is need to standardise the technology suitable for different areas for quality seed production. To get the required bulb production of quality by 2020, there is also need to inculcate the concept of seed village for onion seed production to meet the requirement of the area for quality seed of desirable variety.

The quality seeds having good germination may help in reducing the seed rate per hectare from the existing 7 - 8 kg to 4 - 5 kg. The trend of nursery production and supply of healthy nursery for onion will have good scope when we consider Onion 2020.

Hybrid Varieties

Although many hybrids including F1 hybrids are available in different parts of the world, the hybrid varieties are not much popular in India mainly because of high seed cost. So local varieties still have scope for improvement and can be adopted to the local climatic conditions for better bulb development. The hybrid varieties are presently used only on a limited scale, particularly, in contract production for export and processing. The introduction of hybrid varieties through making of quality seeds at reasonable rates can be of help to increase the productivity and eliminate the defects in the crop, particularly bolting and doubling are seen increasing in the local varieties.

Golden Yellow Hybrid Onion

The use of biotechnological tools for developing disease resistant varieties or early maturing varieties is a need for Onion of 2020. Although the work is in progress at research institutes by exploiting the sources from wild species of onion, it may take more time to bring such hybrids for commercial cultivation.

To meet the requirement of 2020, the import of hybrid varieties can be increased as there are many hybrids which have been tested by NHRDF under short day conditions giving encouraging results under Indian conditions with the production level ranging from 500 – 600 quintal/hactare.

Optimum Use

Keeping in view the limited resources such as cultivable land and irrigation water, there is a strong need to increase the productivity and extend use of micro irrigation techniques as well as mulching technology on larger areas.

The maintenance of plant population through manipulation of spacing and selection of the planting system to provide more sun light and aeration to each plant can increase the productivity. By managing the most appropriate plant population we can encourage better growth and bulb development to meet the production targets through increased productivity. Selection of early maturing varieties and nutrient management for enhancing the growth may also help to get better crop from less land and water as observed in the trials conducted by NHRDF with micro irrigation, plant geometry, fertigation and use of growth regulators in onion. The onion of 2020 may have all these things included in the package of practices for onion cultivation as common practices.

Sprinkler Irrigation

Drip Irrigation

Keeping in view the increased cost of production and requirement of location specific technologies particularly for nursery management, weed management and nutrient management, precision farming technologies can be tried

Crop Rotation

Mono-cropping affects the productivity levels as also the disease and pest problem. Also there is a risk of damage to crop and inter cropping is the best alternative to make use of natural resources and plant protection in a better way.

Similarly crop rotations shall keep crop free from many diseases and pests apart from increased productivity by adopting better crop rotation. Onion after soybean or groundnut has proved increased productivity during *rabi* whereas late kharif crop of onion after *bajra* gives higher production of *rangda* crop. Inter crop of onion in sugarcane is already in practice and it needs to be popularised in other areas using fertigation techniques for higher productivity of both crops.

Organic Production

There has been increasing demand for organically produced horticultural crops and efforts are being made for many crops for production through organic practices and also under Eurep Gap and Global Gap certification. Not only for export to European countries, it is also required in many other countries for domestic supplies and may be the common need of the future.

The organic farming practices are to be popularised and adopted to maintain the required productivity level. The production and use of *vermi* compost, use of green manuring, use of bio-fertilizers and bio-pesticides can scale down the bulk use of chemical fertilizers and pesticides. Increased use of many biological tools can also be tried to monitor insect population to achieve the organic production.

However, it will also be essential to market the organically produced onion under a brand name with assured quality and Onion 2020 might have retail shops selling organic onions under consumer packing and prime rates as awareness about the medicinal properties of organically produced onion bulbs go up.

Precision Farming

Keeping in view the increased cost of production and requirement of location specific technologies particularly for nursery management, weed management and nutrient management, precision farming technologies can be tried. Based on the soil and plant health analysis and keeping in view the impact of local weather conditions on bulb development, precision farming techniques are to be popularised through FLDs in potential areas. Care shall be taken to avoid entry of new weeds and diseases and pests through manures and fertilisers from different sources as also planting material and seeds meant for use in different areas.

The onion of 2020 may see that these practices as well integrated management practices are widely adopted by the farmers as strategies are to be developed for such practices as per the recommendations of core group formed after the crisis of onion in 1999-99.

Soil Health

The soil health analysis to find out micro flora present in the soil to plant protection techniques accordingly is very important due to the high price of chemicals, pesticides and their adverse effects on soil and plant health. That way Intercropping based management is very important for crops like onion in view of the fact that the crop which suffers from many diseases and insect pests is sensitive to weather effects.

In onion production, soil health analysis and nutritional analysis of the soil are important before targeting higher production and quality standards to achieve Onion 2020. Mulching practices also need to be adopted for maintaining soil microflora while maintaining the soil temperature and moisture levels.

Mechanisation

Onion is a labour intensive crop where more labour is required for operations like transplanting, weeding, harvesting and neck cutting. Due to non-availability of labour at required time and increased labour, the cost of production of onion is increasing day by day. Hence there is a strong need for mechanisation. The pneumatic seeder for sowing, transplanter, harvester toppers as well as graders are all available but Indian onion farmers have to get them standardised and popularised as per the Indian conditions. Keeping in view the soil conditions and size of the land holding there is a need to make improvements and modifications in these machines and onion 2020 shall definitely see that mechanisation is more adopted in onion.

The transplanter is being practised by some of the farmers and they have used the planting machines where some modifications are made locally. To take planting of onions with these machines, a new thought wave for the improvements on our facilities is required. For this, the planting system, needs to be modified and more research applied to popularise the mechanisation

in onion farming to envisage the targets set for Onion 2020.

Alternate Technologies

In order to minimise the effect of weather vagaries and get the crop in short time, the nursery raising under protected conditions and production of onion through direct seeding instead of transplanting as also production of onion through sets are the alternate technologies which can be adopted to minimise the risk.

Nursery rising for kharif and late kharif onion under shed net to avoid the effect of high temperature and heavy rains has already been practiced in some areas particularly for hybrid seeds to reduce the damage in nursery and also for taking the nursery when outside conditions are not favourable for nursery rising. This technique has to be popularised on much wider scale to get the onion production with more availability of healthy seedlings in the coming years.

Through direct seeding method the total crop duration can be reduced by 30 – 50 days, however, weed-free field and soil treatment to avoid the loss of seedlings due to mortality and pallatization of seeds etc. as well as sowing with the help of pneumatic seeder are the technologies which are to be associated with this practice.

The set production is a common practice followed in Gujarat and Rajasthan as well as in many other parts and is becoming popular where sets can be produced during summer and planting is done after the rains with ridge and furrow method to get bulb development within 60 – 65 days. This practice can be extended to different areas to meet the onion requirement when kharif crop fetch problems due to adverse weather conditions in particular. More adoption of these techniques may be the requirement for onion 2020.

Contract Farming

Assured supply of produce at desirable time and assured returns to the farmer can be achieved through the contract farming which is now becoming popular for different crops including onion. This may be adopted by the farmers on wider scale particularly for export and processing to get desirable produce and at required time. It may also be used for organic production and by forming group of farmers to take up production by availing common facilities and saving of many expenditures involved, contract farming may be the better option for onion farming. The increasing trend of this practice and entries of exporters, processors as well as many multinationals including agencies like Reliance Fresh is marking the trend that by 2020 a large number of farmers may opt for contract farming. This will also allow the technology adoption in a much better way and get benefit of the technologies already developed but not used by individual farmers.

Onion Transplanter

Processing and Export of Processed Products

Although onion is a good crop for processing particularly through dehydration and a large number of units in operation in Mahuva area in Gujarat, it is noticed that in recent years the demand for processed products is increasing both for export and domestic markets and there is scope for increased processing.

The availability of raw material is sometimes a constraint for processors and thus it appears that there is need to increase raw material production keeping in view increased scope of onion processing. Similarly other processed products such as onion pickles, onion crush, onion paste, onion puri, frozen onion rings, onion brine etc can be developed and popularised so that onion processing industry can run profitably and products are also available at reasonable rates to the consumers.

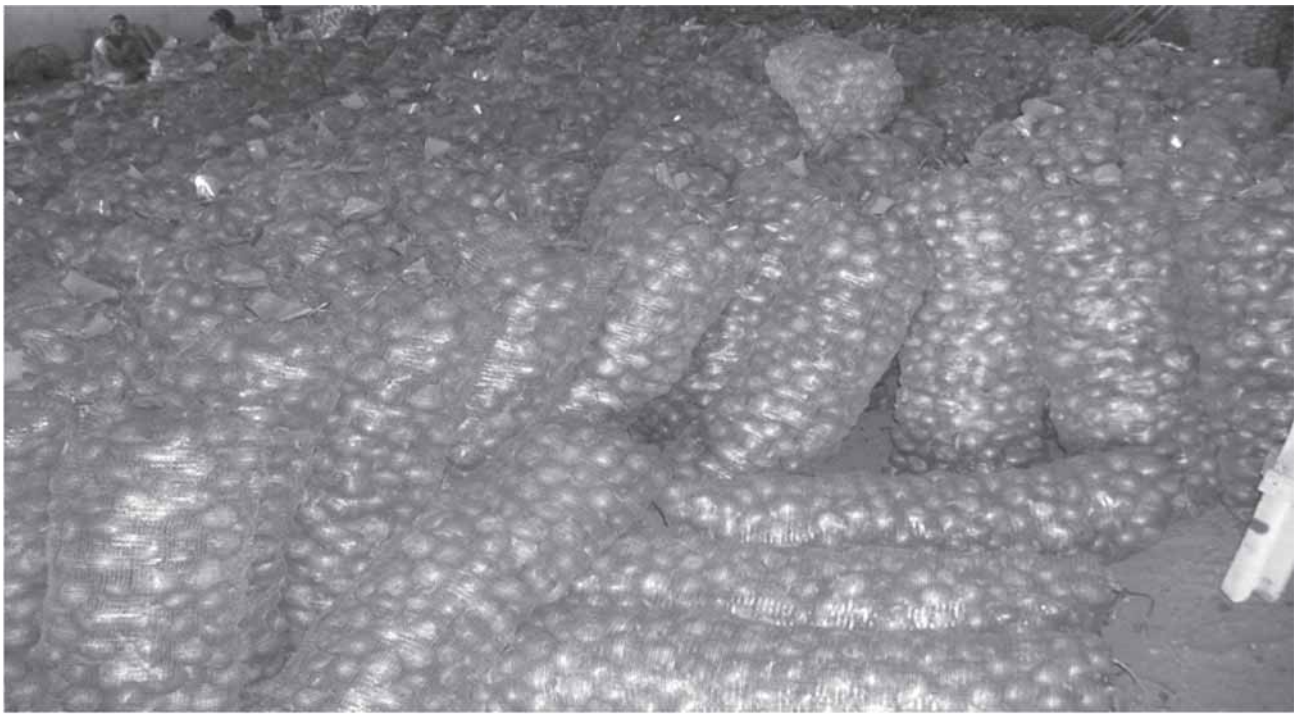
Increasing demand for processing and export of processed products gives an indication that by 2020 there may be increased production of onion for processing and thus R&D in this direction needs to be strengthened to meet the requirement of raw material as well as other factors such as packing and storage of processed products which are also to be attended suitably. The waste obtained after processing of onion can be converted into vermi compost and used as manure.

Irradiation

Irradiation of onion with the help of gamma rays is standard practice and irradiated onions are accepted in many countries. Onion irradiation unit was established by BARC at Lasalgaon.

Getting the bulbs irradiated and their storage is required without much disturbance. Hence this technology has to be popularised for export where it would be essential to have linkage between exporters and irradiation unit in a compact area to avoid excessive cost on transportation and system of handling be such to avoid disturbance of onions after irradiation.

The effect of irradiation is to be combined with ventilated storage system to get better performance for storage and it is expected that these facilities shall be used by more No. of users including farmers and exporters as well as processors by 2020. This technology can help storage of onions at moderate temperature and thereby reduce cold storage costs.



Consumer Packing – bagged Onion

Post Harvest Management and Storage

Emphasis has to be given on post harvest handling and storage with increased storage capacity to meet the requirements of the entire year. Keeping in view the increased quantity required for processing, export and domestic consumption the storage has to be increased by 10 percent every year and by 2020 the storage capacity must increase from the present 30 lakh MT upto 60 lakh MT with estimated targets of 33 – 35 lakh MT export out of projected 165 lakh MT production. The standardised PHM technology needs to be extended to farmers through intensive trainings and locally required modification needs to be included for better results.

Field curing, shed curing, neck cutting, disinfection of go down and premises used for onion handling, pre-harvest treatments to reduce post harvest losses and mainly the quality of bulbs required for better storage needs to be elaborated to the users for better adoption of technology and avoid losses to maintaining availability of onion 2020. There is strong need to give intensive training as PHM and storage on extensive scale in different parts of country are to be suitably arranged as per locally prevailing conditions.

Marketing

In onion the marketing has always been a constraint to maintain the price level and as onion is a semi perishable commodity it needs lot of care in handling and marketing Govt. agencies involved in marketing of onion were not very successful. The forward marketing is also not seen to be very successful in the onion due to its perishable nature and heavy fluctuation in the prices. However, in order to reduce the gap between on farm price and retail price of onion, the introduction of consumer packing to minimise handling in marketing chain, forming associations of growers with provision of retail marketing facilities in important cities and marketing under a brand name may be more purposeful in the coming years and may also overcome the problems of onion marketing faced presently.

The fluctuation in prices can be avoided by promoting the farmers for more storage and also by providing assistance on packing, transportation and retail marketing by giving the benefit of different government schemes so that profit level of farmer is maintained and he is encouraged to grow more onions to meet the increased requirements of 2020.

Extended Needs

There is also need to change the food habits by accepting green onions whenever there is less availability of matured bulbs. There is also the need to popularize onion cultivation in kitchen gardens, in pots, trays, terrace gardening etc to overcome the onion requirement particularly for green onions. Awareness of people in this regard may yield some results and this will give fresh onions for consumption and also help the Indian onions to contribute more in export in the coming years.

The introduction of spring onion, leek and shallot on more areas by using available varieties and cultivation of these under protected condition such as polyhouses can also be developed in the coming days.

In short, onion 2020 has very bright future which may give better profit to the farmers and also hike the availability at reasonable rates to the consumers with the help of adoption of technologies developed for onion production, post harvest management and storage.

**The Writer is Additional Director, NHRDF, Nashik (MS)*

FOOD SECURITY

Strategic Approach to Higher Agriculture Production

By **D. Muthamizh Vendan Murugavel***

"Of all things before us, agriculture comes first"- Jawaharlal Nehru

Of India's total geographical area of 329 million hectares, only 145 million hectare is cultivable land. At the same time, the day-by-day per capita land availability is decreasing from 0.48 hectare in 1952 to 0.15 hectare at present.

Meeting the food security and livelihood needs of the future is a challenging task. In India, about 75 percent of children are underweight due to lack of proper nutrition. The population is increasing very fast at the rate of 1.9 per annum. However, the average growth rate of food (agriculture) production is only 2.1 percent. Hence, there is no option but to produce more and more food grains and other commodities. Indian will see a surge in the domestic food demand from 168.3 million metric tonnes in 1991 to 343 million metric tonnes in 2020 or maybe even more.

Engulfed within a vortex of population growth, economic instability and climate change, food security has become an urgent challenge for national and global governance. Food security means the easy availability and access of food at all times in sufficient quantity in a safe and nutritious form to meet the dietary requirements and food preferences for an active, healthy and productive life. In fact, food security is the prerequisite for the economic and social stability of any nation. Again sustainable food security requires a stable supply of good and properly functioning agricultural markets.

Millions of people worldwide suffer from hunger and under-nutrition. A major factor contributing to this international problem is food insecurity. This condition exists when people lack sustainable physical or economic access to enough safe, nutritious, and socially acceptable food for a healthy and productive life. Food insecurity may be chronic, seasonal, or temporary, and it may occur at the household, regional, or national level.

The World Development Report 2008 called for greater investment in agriculture in developing countries (World Bank, 2008). It warned that the agri sector must be placed at the centre of the development agenda if the Millennium Development Goal (MDGs) of halving extreme poverty and hunger by 2015 has to be realised. Yet, while 75

percent of the world's poor live in rural areas, a mere 4 percent of official development assistance (ODA) goes to agriculture in developing countries. The share of agriculture in ODA has declined sharply in the last two decades, and this neglect of agriculture is all the more striking because it was in the face of rising rural poverty.

Hunger Index

As per the Global Hunger Index (GHI) released by International Food Policy Research Institute (IFPRI) in October 2008, India's rank was dismal in 66th position among 88 countries. The GHI of India was 23.70, sandwiched between 23.53 of Burkina Faso and 23.83 of Zimbabwe, the 65th and 67th rank holders respectively. In fact, India's performance on hunger elimination during the last 18 years was stated to be 'lacklustre' by IFPRI, because the index declined only marginally from 32.5 in 1990 to 23.7 in 2008. Except Bangladesh with GHI of 25.7 (rank 70), other neighbouring countries Pakistan 21.7 (61), Nepal 20.57 (57) and Sri Lanka 15.0 (40) were better than India. According to IFPRI three factors contribute to hunger index, namely proportion of population under nourished (PUN), prevalence of under weight in children under five years age (CUW) and proportion of children dying before the age of five i.e. mortality rate (CM).

The number of people lacking access to the minimum diet has risen from 824 million in the Millennium Development Goal (MDG) baseline year 1990 to 1,020 million in 2009. In South Asia 46 percent of young children are underweight; in India less food is available to rural households than in the 1950s. The absence of vital protein and micro-nutrients such as iron and iodine impairs the ability to learn and reduces resistance to disease, especially in young children. There is a projection that global food production must rise by 70 percent by 2050 to meet the needs of the projected 40 percent growth in world population.

The right to food is considered as a fundamental human right and internationally related to the government's responsibility to provide social protection and promote household

Production of Major Crops in India (Million Tonnes)

Crop	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	
					Target	Achievement*
Rice	83.1	91.8	93.4	96.7	97.0	99.4
Wheat	68.6	69.4	75.8	78.6	78.5	77.6
Coarse cereals	33.5	34.1	33.9	40.8	42.0	38.7
Pulses	13.1	13.4	14.2	14.8	15.5	14.2
Foodgrains	**198.4**	**208.6**	**217.3**	**230.8**	**233.0**	**229.9**

Source: *Ministry of Agriculture; *Third Advance Estimates*

Production Requirements by 2020 to meet the Balanced Diet Norms prescribed by ICMR

Crops	Requirement	Requirement in million tonnes		
	Per day in gms	2000	2010	2020
Cereal and Millets	420	198.7	237.4	280.99
Pulses and legumes	40	18.92	22.61	26.76
Foodgrains	460	212.62	260.01	307.75
Roots and Tubers	75	35.48	42.39	50.18
Vegetables	125	91.66	109.52	129.62
Fruits	50	36.66	43.81	51.85
Milk	150	70.96	84.79	100.35
Fats and Oils	22	10.41	12.44	14.72
Sugar	30	14.19	16.96	20.07
Egg	45	21.29	25.44	30.11
Meat	25	11.83	14.13	16.73
Fish	25	11.83	14.13	16.73
Population	-	1004.5	1200.17	1420.54

Source: *UN Long Term Population and ICMR Dietary Requirement for a Balanced Diet*

economic security. In order to enhance ownership of this right, one of our main challenges will be to carefully examine the coping strategies of poor families and their children to overcome food insecurity.

Causes of Food Crisis

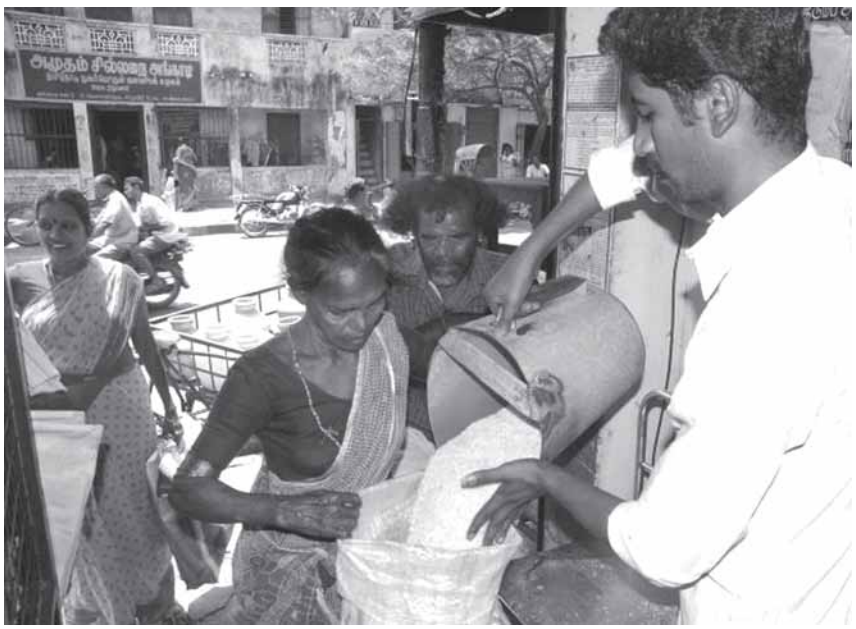
- Poor weather conditions in many parts of the world
- A substantial increase in fertilizer prices
- A huge increase in oil prices
- The partial failure of Green Revolution
- Explosive population Growth and Urbanisation
- Land Grabbing
- The lack of attention to relevant agricultural research and extension by public bodies
- Excessive use of ground water in cultivation
- Inadequate attention to preserving or regenerating land and soil quality
- Over-use of chemical inputs that have long run implications for both safety and productivity
- The ecological implications of both pollution and climate change, including desertification and loss of cultivable land.

Rising income level of over the past years has not supported the basic issue of ensuring the food security of the population. Instead, nutrition indicators have stagnated and per capita calorie consumption has actually declined, suggesting that the problem of hunger may have got worse rather than better.

The urgency of tackling these causes of food insecurity is redoubled by our knowledge of the impact of climate change which has caused poor harvests in different ways ranging from droughts to excessive rain in many parts of the world. In South and East Asia, the retreat of Himalayan glaciers threatens food security through disruption to the critical water cycle. One fifth of the world's population lives in the five major river basins of the Himalayan water towers.

Despite these warnings, climate negotiators are predicting a two degree temperature rise as an acceptable threshold, leaving poorer countries to adapt as best they can. National Adaptation Programmes of Actions prepared by the Least Developed Countries focus on modest community-level initiatives, including the use of alternative seed varieties, improved soil management, maintenance of water management systems and reforestation.

Persistently high food prices in the developing world continue to cripple access to food for a large number of vulnerable population in both urban and rural areas. Hence, it becomes necessary to avoid instability in domestic prices of food grain and curb speculative tendencies.



Outlook

Food insecurity and hunger are real and growing problems in India and the entire world. The roots of crisis highlighted by analysts seemed to have been ignored by policy makers in most countries. Burgeoning population of India leads to increase in consumption, but since the production is not growing at the same rate, there needs a mechanism to ensure enough food for the poor. Areas of production have to be increased still. We also need to implement measures like rain water harvesting, watershed management along with improvements in irrigation facilities. Efforts to increase the production of fruits, vegetables and horticultural crops would ensure both food security and adequate remuneration for farmers.

The Food Security Act should ideally be an opportunity for the government to show its seriousness of purpose and commitment. For that, however, it should go beyond piecemeal measures to comprehensively ensure that food is a basic human right, addressing both immediate hunger and, in the longer term, all the three aspects of availability, access and nutritional outcomes. This calls for a life-cycle approach, starting with addressing the rights of the child, continuing through to old age, adopting an inclusive approach, greater coordination between departments and ministries, making the necessary investments and budgetary allocations to ensure both adequate production and mechanisms to cope with climate change, and greater vigilance in ensuring effective distribution and utilisation of allocations made.

To eliminate the problem of hunger, the political framework of democracy and an uncensored press can make a substantial contribution, but it also calls for activism of the public. Above all, agriculture must be given prime importance and must be governed by farmers, rather than institutions that are profit-oriented, to ensure long term food security.

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Turmeric

Huge Potential Despite Challenges in Marketing

By **K.M. Deepa***

Agricultural sector plays a pivotal in the economic development of the country. Agriculture is a major component of the Indian economy, More than 75 percent of Indians earn their livelihood from agriculture and agriculture oriented works. Mahatma Gandhi said, "Indian economy lives in rural villages". It is from villages many of the industries are getting their raw material that too from agriculture sector. Both agriculture and Industry are interdependent. Agricultural development promotes industrial expansion and developed industries in turn help the agricultural sector by providing larger and larger markets and greater income. Nearly 40 percent of the national income of India is derived from agriculture. Turmeric is a farm product that has multifarious applications.

History

The exact origin of turmeric is unidentified but it is said that it originated in the parts of western India. It has been used in India for 5000 years now. Initially it was cultivated as a dye as its bright yellow color works as a colouring agent. Then with passing of time people came to know about its developed uses and they started using it for cosmetic purposes and then as a medicine. Turmeric reached China by 700AD, East Africa by 800AD and West Africa by 1200AD and started becoming popular throughout the world.

The Arab traders took turmeric to Europe in 13th century. Marco Polo was so impressed by turmeric that he mentioned it as a vegetable that has properties of saffron, but it is not really saffron. Ancient Indian medical literature, Ayurveda also mentions about turmeric being an extremely effective herb for stomach disorders and food poisoning.

India Ahead

Currently, India is the major producer and consumer of turmeric. China is second largest supplier of the spice and it is followed by a number of other countries in the Indian sub-continent, Southeast Asia, the Caribbean and Latin America. None of these are of significance as oleoresin suppliers. Other producers in Asia include Bangladesh, Pakistan, Sri Lanka, Taiwan, China, Burma (Myanmar), and Indonesia. Turmeric is also produced in the Caribbean and Latin America: Jamaica, Haiti, Costa Rica, Peru, and Brazil. The use of the spice spread widely in Oceania, but it is not used as a condiment in Melanesia and Polynesia. There are two dominant types of turmeric in the world market: 'Madras', and 'Alleppey', both named after the regions of production in India. The orange-yellow flesh Alleppey turmeric is predominantly imported by the US,

Ancient Indian medical literature, Ayurveda also mentions about turmeric being an extremely effective herb for stomach disorders and food poisoning

where users prefer it as a spice and a food colorant. Alleppey turmeric contains about 3.5-5.5 percent volatile oils, and 4-7 percent curcumin.

In contrast, the Madras type contains only 2 percent of volatile oils and 2 percent of curcumin. The Madras turmeric is preferred by the British and Middle Eastern markets, for it is intense, brighter and lighter yellow colour, better suited for mustard paste and curry powder or paste used in oriental dishes. Turmeric produced in the Caribbean, Central and South America has low curcumin and volatile oil contents, and is darker and is not desired by the US importers.

The Bengal type is preferred for use in dyes in India. It is interesting to note that in the US, turmeric is considered as a spice by the food industry, whereas the FDA classifies it as a food colorant. The major producer, India, exports to the most of the consumers. UAE, US, Bangladesh, Japan, Sri Lanka, Malaysia and UK, together account for about 65 percent of Indian turmeric exports.

India Scenario

India is the largest producer, consumer and exporter of turmeric in the world. The country consumes most (80 percent) of its turmeric production and it exports the surplus. Turmeric is grown in as many as 25 states of India with Andhra Pradesh, Tamilnadu, Karnataka and Orissa being the leading producers. Other main producers of turmeric are Gujarat, West Bengal, Assam, Meghalaya and Maharashtra. India has nearly 186 thousand hectares under turmeric cultivation during the year 2006-2007. Andhra Pradesh topped both in area and production during the year 2006-2007 with 69990 hectares (40.46 percent) and 518550 tonnes (60.60 percent), respectively. Tamil Nadu followed with acreage of 25970 hectares (15.01 percent) and production of 143358 tonnes (16.75 percent).

Important Studies

A few studies have been already made in the marketing of turmeric. Some of the important studies on the related topics have been reviewed here. *Balaraman Nair. M. (1980*) made an attempt to study on India's Export Trade in Turmeric and Ginger. The study concluded that India's export trade increase year to year. Boosting the export trade by diversification of products and market is very important. The new technique for processing turmeric evolved by CFTRI may be popularized among farmers to improve the quality of the produce".

Lakshmanachar, M.S. (1980) studied the marketing of turmeric and ginger in India. The study concluded that supply exceeds demand; the stated and central level co-operative organisations should enter the market and procure the surplus supplies. This could be maintained as a buffer stock for realizing in the off-season. Agricultural produce market act should be introduced and enforced for ginger and turmeric in states like Kerala. The farmers should be educated for selling their produce in regulated markets. The directorate of marketing and inspection may update their published reports on marketing of turmeric and ginger by conducting necessary surveys.

P.G.Gadgil (1981) studied the Marketing of turmeric in Sangli District, revealed the extent or concentration in the commission agency business. The study also concluded that the margin of intermediaries appeared to be reasonably low and the return from the storage was not a dominant factor in the margin of intermediaries.

N.Raveendaran (1981) studied the performance of farmers towards the various agencies engaged in turmeric marketing in Tamil Nadu and to analyse the domestic trade of turmeric through price spread and market structure. From the study on price spread, he concluded that the marketing margin of the wholesaler, secondary wholesaler-cum-processor and retailer were 4.74 percent, 5.98 percent and 30.06 percent respectively on consumer's rupee

R.Baskaran (1987) studied the Marketing of turmeric in Erode regulated market. An attempt was made to assess the performance of Erode regulated market in the marketing of turmeric. The study showed that the farmers' response to regulated market in terms of quantity has increased. Increased arrivals in the regulated market need not result in increased revenue for the regulated market because of the reduced price which results in reduced market fee.

V.B. Jugale (1988) studied the Role of regulated market in marketing the turmeric produce with reference to Sangli

Turmeric Varieties

Sl. No.	Variety	Mean yield (fresh) (t/ha)	Crop duration (days)	Dry recovery (%)	Curcumin (%)	Oleoresin (%)	Essential oil(%)
1.	Suvarna	17.4	200	20.0	4.3	13.5	7.0
2.	Suguna	29.3	190	12.0	7.3	13.5	6.0
3.	Sudarsana	28.8	190	12.0	5.3	15.0	7.0
4.	IISR Prabha	37.5	195	19.5	6.5	15.0	6.5
5.	IISR Prathibha	39.1	188	18.5	6.2	16.2	6.2
6.	Co-1	30.0	285	19.5	3.2	6.7	3.2
7.	BSR-1	30.7	285	20.5	4.2	4.0	3.7
8.	Krishna	9.2	240	16.4	2.8	3.8	2.0
9.	Sugandham	15.0	210	23.3	3.1	11.0	2.7
10.	Roma	20.7	250	31.0	9.3	13.2	4.2
11.	Suroma	20.0	255	26.0	9.3	13.1	4.4
12.	Ranga	29.0	250	24.8	6.3	13.5	4.4
13.	Rasmi	31.3	240	23.0	6.4	13.4	4.4
14.	Rajendra Sonia	42.0	225	18.0	8.4	-	5.0
15.	IISR Alleppey Supreme	35.4	210	19.3	6.0	16.0	-
16.	IISR Kedaram	34.5	210	18.9	5.5	13.6	-

District. He found that the marketing organisation in Sangli is functioning well in spite of speculation. But the cultivation of turmeric is labour intensive and where labour supply is scarce, there it is not profitable. For this a minimum price policy or price according to costs should be brought under implementation.

Y. Eswara Prasad (1989) studied the price response analysis of Turmeric in Guntur Market. The main objective of the study was to analyses the patterns of arrivals and prices of turmeric. The arrivals in the post-harvest period increase the availability in the market resulting in the lowering prices. A trend in arrivals of turmeric bulbs was testimony to the dominant and growing stature of the Guntur market. But prices have neither increased nor decreased on a long term basis and this aspect needs closer examination.

Srinivasan (1990) studied the Marketing of turmeric (with special reference to Periyar District, an attempt was made to analyse the working of the regulated market, the market arrivals of turmeric, the conditions of turmeric cultivation and its implication and to examine the integrations of markets in India with special reference to Erode, Duggirala and Bombay. It was revealed that the arrivals of turmeric into Erode as a whole. The cultivation expenditure and marketing cost varied directly with area under turmeric cultivation. It was also concluded that the whole-sale prices of turmeric at Erode, Duggirals and Bombay showed conspicuous differences because of transport and other factors influencing marketing and production.

Y. Radha (1994) studied the price analysis of turmeric in different markets of Andhra Pradesh. Price analysis of turmeric was taken with the main objective of studying the trend in monthly price as well as seasonal fluctuations in whole sale prices. Three major agricultural market committees viz., Duggrila, Nizamabad and Cuddapah were selected for which monthly average whole sale prices were collected over a period of 11 years from 1983-84 to 1993-94. Seasonal variation was observed to be highest during the months of November in Duggirla and Nizamabad market but during December in Cuddapah market. The price movement in one market is influenced by movement in other markets and turmeric prices are closely associated between these markets.

B.B. Singh (1995) studied the price spread of turmeric marketing in Bihar and Andhra Pradesh. A temporal and spatial analysis; Agricultural produce market Samastipur, which is the most important turmeric market of Bihar was selected. The results have been compared with the similar study conduct in Duggirala market of Andhra Pradesh during the year 1987-88. It has been observed that marketing system of turmeric in the selected market of Andhra Pradesh was more efficient than the selected market of Bihar. The total marketing margin in absolute terms as well as in terms of percentage of consumer's price is very high in Bihar market as compared to Andhra Pradesh.

It is suggested from the study the marketing system of turmeric in Bihar needs to be made efficient by shortening the trade channel and reducing the high retailer's margin.

Scope of the Study

The findings of the study would help to understand, the problems faced by the turmeric growers in marketing of turmeric in erode district.

Objectives of the Study

To identify the problems faced by the turmeric grower in marketing of turmeric

This study is an empirical research based on the survey method. The study is based on primary and secondary data. The required primary data has been gathered from the respondents with the help of a well structured and pre-tested interview schedule. The necessary secondary information was collected from various journals, magazines, news paper, books and websites.

Sampling Design

For the purpose of the study a multistage random sampling technique was adopted.

There are fourteen taluks in Erode District in which Gobichettipalayam Taluk is the second largest taluk under turmeric cultivation. So, Gobichettipalayam taluk was selected which constitutes the universe for this study.

Selection of Block

The present study is confined to Gobichettipalayam Taluk having three blocks namely Gobi, Nambiyur and Thookanaikanpalayam. Out of these three blocks, Gobichettipalayam block was selected.

Selection of Growers

The sample size of present study is 200. They were selected by adopting convenience sampling technique. Gobichettipalayam Block has 20 Panchayat Villages. From each village 10 sample respondents were selected.

Constraints In Marketing Of Turmeric: Ranking Analysis

The problem having highest mean value is considered to be the most important.

Table no: 1 discuss the ranking analysis for finding out the marketing problems faced by the turmeric growers.

The table no:1 indicates that the forced sales with the mean score of 6.92, followed by lack of awareness about market information 5.80, followed price fluctuation with the mean score of 5.68, followed by high commission charges with the mean score of 5.64, followed by high cost of storage with the mean score 5.56, followed by Weighing problem with the mean score of 5.52, followed by low price with mean score of 5.28, followed by high cost of transport with the mean score of 5.04, followed by market fees with the mean score of 4.94 and followed by delay in payment with the mean score of 4.72.

It is concluded that the "Forced Sales" is an important marketing problems faced by the turmeric growers.

Findings of the Study

Table No: 1

Scale And Score Values Of Marketing Problems Faced By The Turmeric Growers

S.No	Reasons	Total Score	Mean Value	Rank
1	Delay in payment	472	4.72	X
2	High commission charges	564	5.64	IV
3	Low price	528	5.28	VII
4	Price fluctuation	568	5.68	III
5	Lack of awareness about market information	580	5.80	II
6	Forced sales	692	6.92	I
7	High cost of transport	504	5.04	VIII
8	High Market fees	494	4.94	IX
9	High cost of storage	556	5.56	V
10	Weighing problem	552	5.52	VI

To analyse the problem which is the most important factor simple ranking analysis have been applied. It is found that forced sales is the foremost important marketing problem faced by the turmeric growers while marketing their turmeric, followed by lack of awareness about market information, price fluctuation, high commission charges, high cost of storage, weighing problem, low price, cost of transport, high market fees and delay in payment.

It is found that 'Forced Sales' is the major marketing problem of turmeric growers. It is also found from the study that indebtedness and lack of storage facilities are the important reasons for forced sales

It is concluded that the forced sales is the most important problems faced by the turmeric growers So, to adopt the facilities in the market by way of fastest growing technologies.

Suggestions of the Study

- It is found that 'Forced Sales' is the major marketing problem of turmeric growers. It is also found from the study that indebtedness and lack of storage facilities are the important reasons for forced sales.

  Hence it is suggested that interest free loans may be offered to the turmeric growers and additional storage facilities may be provided by the Government in the vicinity of the turmeric growers.

- It is identified that the farmers are not having enough sources to know the market information about the price of turmeric.

  In this regard the Government may take necessary steps to communicate the market information about the price through various media.

- With intention to reduce labour intensity it may be suggested that drip irrigation may be followed for which liberal monetary support may be extended by the government.

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Invasive Alien Species and its Impact on Soil, Water and Environment

By **P. Dey***

International Union for Conservation of Nature and Natural Resources (IUCN) defines Invasive Alien Species as an alien species which becomes established in natural or semi-natural ecosystems or habitat, an agent of change, and threatens native biological diversity. These invasive species are widely distributed in all kinds of ecosystems throughout the world, and include all categories of living organisms. They are non-natives and either deliberately or accidentally introduced in new habitat causing dramatic environmental changes that lead to major decline in native population. They have the capacity to alter hydrology, nutrient mining, and can alter gene pool through hybridisation.

Invasive species are good at exploiting bare soil and empty niches. Being non-natives they infest natural ecosystems, including forest, range lands, and pastures and dreaded ones can transform diverse and productive ecosystem into sterile land. The global economic loss by invasive alien species including cost of control has been estimated at about Rs 63,00,000 crore rupees per year. One way to avoid invasive species is to choose the ones that are native to the area. Natives often are adapted to a specific environmental niche, and have natural controls that keep them in balance. Invasive species, on the other hand, are tolerant against environmental extremes and possess greater flexibility for survival in wide range of conditions with high water, light and nutrient use efficiencies. Some of the invasive species also exhibit fire resistance besides better competitive ability and allelopathy.

Causes of invasion

Land disturbance particularly by grazing, mining, urban development etc. which causes removal of vegetation and disturbs soil generally promote invasive alien species. Absence of predators and parasites in new found habitat that otherwise kept invasive alien species under control in native habitat, also helps in advancing invasive alien species. Land development such as fragmentation, corridors through undisturbed vegetation helps enabling the spread of invasive species. Global change such as elevated

CO_2 level due to greenhouse effect, climate change also promotes invasive alien species. The present era of globalisation and open market economy has accelerated the influx of invasive alien species. Many of these invasive species have been involved in disastrous ecological impacts. Any invasion undergoes three distinct phases of arrival in new habitat, establishment followed by rapid spread in new found habitat. Each of these three phases of invasions can be managed by three different approaches of quarantine, eradication and containment.

Global Action against Invasive Alien Species

In 1996, concern that invasive species might be one of the most significant "negative externalities" of globalization brought 78 countries and numerous international and intergovernmental organizations together at the "Trondheim Conference." This meeting, sponsored by Norway and the United Nations, was the first global effort to assess the impact of invasive species on the environment. Participants concluded that:

- The impact of invasive species is "immense, insidious, increasing, and irreversible." In other words, every country has been impacted by invasive species, the patterns and trends follow that of globalisation, and as long as we engage in international trade, travel, and transport we'll need to manage this problem;
- Aside from climate change, invasive species are the most significant threat to the environment worldwide. Developing countries will be severely impacted, particularly Small Island Developing States (SIDS); and
- A global plan and strategy is urgently needed to address the problem.

In 1997, three international organisations came together with a commitment to share their expertise and other resources in order to address the scientific and technical aspects of the problems identified in Trondheim. The World Conservation Union (IUCN), CAB International (CABI), and the Scientific Committee on Problems of the Environment (SCOPE) formed the Global Invasive Species Programme (GISP). GISP is a coalition of scientific and technical experts

Invasive Species of India

Invasive alien species of plants/animals/ microorganisms are as equally ancient as human civilisation, and are ongoing chronologically indistinguishable by man. However, biological invasions have lately become one of the major global issues of concern since June 1992 soon after the UNCED's Earth Summit held in Rio de Janeiro, Brazil. It was estimated that about 40 percent of the species in the Indian flora are alien, of which 25 percent are invasive in nature. *Parthenium hysterophorus*, first report in 1951 from Maharashtra was introduced from Tropical America and presently has stretched throughout the length and breadth of India. *Lantana camara* was introduced in 1809-10 from Tropical and subtropical America has reached in submontane regions of the outer Himalaya to southernmost part of India. *Eichornia crassipes* was introduced in 1914–16 from Brazil has extended large area of water bodies of India. *Mikania micrantha* is rather neo-tropical origin but has extended natural forests, plantations, agricultural systems in northeast and southwest India. Other invasive species of India include *Ageratum conizoides*, *Cytisus scoparius*, *Eupatorium adenophorum*, *Eupatorium odoratum*, *Parthenium bysterophorus*. Eutrophication of water bodies by water hyacinth is a major invasive species of aquatic system. Carrot grass is another major invasive species causing economic loss to many agricultural crops. *Chromolaena* is a invasive climber for North-East Himalaya and Western Ghat region. Invasive insect like coffee berry borer also caused major economic damage. Microbial invasive species causing major economic damage include banana bunchy top virus, turnip stripe virus, potato wart (a fungal disease caused by *Synchytrium endobioticum*) and golden nematode (*Globodera rostochiensis*). In the fishery sector, African catfish, big head carp, tilapia etc. are invasive species which were

Carrot grass is another major invasive species causing economic loss to many agricultural crops. *Chromolaena* is a invasive climber for North-East Himalaya and Western Ghat region

introduced either deliberately or accidentally but all found to pose great threat to the native fishes.

Impacts of invasive species on biodiversity

- Loss of biodiversity due to capture of habitat by IAS
- Extinction of native animal species by predation
- Loss of biodiversity due to increased fire incidence following exotic grass invasion
- Reduced abundance of threatened and endangered species

Impacts of invasive species on soil and water

- Increased soil erosion
- Increased incidence of flooding in some situation
- Increased water use, reduction in water table
- Changes in soil chemistry, e.g., salt accumulation
- Changes in soil microorganisms, e.g., reduced mycorrhizal association with mustards
- Loss in productivity

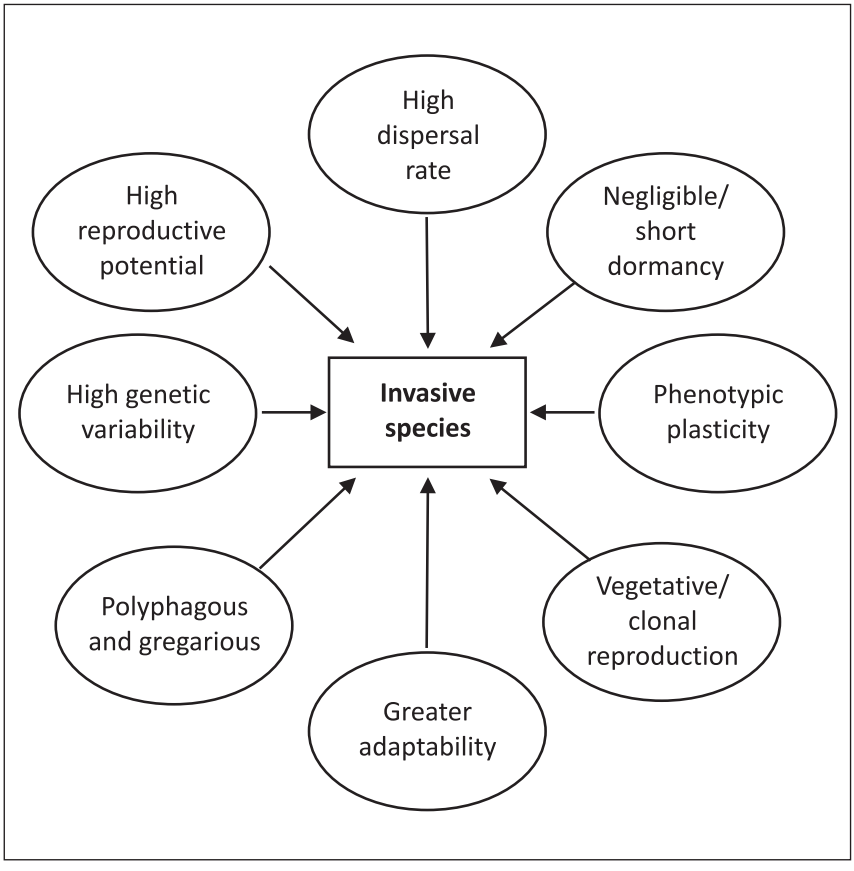
Impacts of invasive species on environment

Some environmental issues are well documented and flagged as the impacts of alien invasive species. The movement of people, commodities and their conveyances through international trade has augmented the danger of transmit of these unwanted organisms. Although many non-native species has been proved to provide great benefits to society, many others after establishment cause significant and often irreparable damage to the native ecosystems beside negative economic consequences in the new found habitat. Invasive species can also cause dramatic ecological changes due to landscape transformations that reduce the adaptability and competitiveness of more desired native species. Such transformation can be caused by the disproportionate use of resources by invasive species like increased ability to capture light, use water, uptake nutrients.

Mechanism of Invasiveness

Invasive species including micro-organisms, plants and animals act as key threat to the functioning of agro-ecosystem although the mechanism is not fully understood. One main reason is that exotic species are too abundant and dominant even in poorly fertile soil and disruptive to the other native species reducing their variability. Majority of the studies have focused on invasive plants and animals, although few have considered the effects of invasive microbes, or interactions of invasive plant and animal species with microbial communities.

Invasive plants, animals and soil micro-organisms have profound effects on the abundance of native species, their diversity and ecosystem functioning. Invasive plants and animals can have major effects on microbial decomposition in soil. Aggressive invasion of a nutrient-demanding, rapidly decomposable, and invasive plant exert large impacts on soil microbial decomposers. The study of microbial ecology and biological invasion has shown that some plant species accumulate pathogens quickly and maintain low densities as a result of the accumulation of species-specific pathogens, whereas others accumulate species-specific pathogens more slowly



Although many non-native species has been proved to provide great benefits to society, many others after establishment cause significant and often irreparable damage to the native ecosystems beside negative economic consequences in the new found habitat

and do not experience negative feedback until plant densities reach high levels indicating differential abilities of plants have to influence their abundance by changing the structure of their soil communities, and that this is an important regulator of plant community structure.

Modus Operandi to Check Invasive Species

Avoid using known invasive species: This is first and foremost principal of avoiding invasive species. For this, a list of invasive species may be widely circulated through media for awareness of general public.

Minimising landscape disturbance: Invasive species thrive well on bare soil and disturbed ground where the native plant/animal/microbial community has been displaced. Protection of healthy native species is the key to control invasive species.

Judicious use of inputs: Many studies have shown that high nitrogen levels provide an advantage to invasive species that are better adapted to using plentiful nutrients for rapid growth and establishment as compared to native species. Soil test based nutrient application in conjunction with manure is important; slow release of nutrient from manures favours native species.

Regular monitoring of land use plan: All land use plans need to be monitored regularly and invasive species need to be checked for their removal. Scouting at regular interval helps in preventing spread of invasive species. Particularly, seeding need to be checked ether by uprooting or by adopting other measures like spot application of herbicide, if necessary. Removal of invasive species when the population is low helps native species to occupy the empty niche.

Future Safeguard Plan and Research Needs

- Build capacity in terms of human resource development and technology transfer to address invasive alien species.
- Promote community participation through awareness generation and involvement in efforts to address IAS through promotion of Public-Private Partnership (PPP) approach.
- In line with USDA Invasive Species Information Centre, National Invasive Species Information Centre may be formed for dissemination of knowledge.
- Early warning system against invasive alien microbial species
- Spatial stochastic modelling to map introduction and spread risks of invasive alien species.
- Hazard analysis and critical control point planning to prevent unintentional introduction of invasive alien species.
- Integrating DNA bar-coding into detection and surveillance programs for invasive alien species.
- Exploiting Allee dynamics in the management of invasions.
- Risk analysis of invasive alien species.

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Role and Application of Medicinal Plants in Enhancing Indigenous Traditional Knowledge

The Study Makes Specific Focus on Tribals in Rajasthan

By **Dr. Harjeet Singh, Manoj Kumar Paliwal, and Punam Paliwal***

Beginning with the study of plants used by the tribal people for food and shelter, the study of traditional knowledge now encompasses facets like conservational practices used by the tribal communities, ethnopharmacology, ethnopharmacognosy and ethnobotany.

The technical knowledge on traditional medicines is considered to be one of the most vital parts of information for all modern drug hunters. This is because such information is taken as a lead in the valuable category, in developing therapeutic aids. Quite a good number of examples can be cited where the plant products used by the present civilised world have been developed from indigenous knowledge.

This paper deals with the topic as to how the tribals have been utilising the plant wealth of forests of Rajasthan, in the vicinity of their villages, for their own welfare. This has really widened the horizon of knowledge since the village people have been using, either the complete plants, their specific organs for curing a series of 15 kinds of ailments like fever, cough, skin diseases, cardiovascular problems, gastrointestinal troubles, and the problems of the male as well as the female reproductive systems etc.

Rich Heritage

India has a rich heritage of indigenous knowledge and practices of healing and care. People's narratives in stratified villages throw light on such knowledge and practices that had guided their lives earlier. The indigenous health culture – related knowledge and practices, which was socially knit into people's daily lives even till mid-20 Century was later threatened by aggression of 'development' and profit making markets. Traditional knowledge on medicinal plants includes information, whether documented or non-documented, of the different kinds and functions of plants developed in or known since ancestral times but subjected to contemporary improvements and adaptations.

The utilisation and management of traditional knowledge on medicinal plants follows customary laws enforced by a collective of elders who exercise leadership in a community or tribe.

Women played a central role in keeping families and communities healthy at large by providing preventive and curative care. There was a time when they were the sole manager of childbirth. Important roles that women played in biological and social reproduction have been ignored and marginalised in time. They protected and transferred their knowledge and practices to the following generations by systematically and skillfully integrating these into the processes of socialisation.

The villages have grown and the socio-economic organisations have changed over the decades. Over the last two decades, there have been intense debates on whether health is a social service or product bred by the rapid commodification of the knowledge intensive drug industry. At the same time,

within the knowledge health medicine sector, there is an emerging trend towards the consumption of herbal health products as alternative treatments to modern. Ayurveda is not an exception under this journey while many biggest ayurvedic drug companies in contemporary India are aggressively marketing various health products and laxatives known as herbal and natural remedy and have no side effect.

Ayurveda, whose history goes back to 5000 BC., is one of the ancient health care systems. The Ayurveda was developed through daily life experiences with the mutual relationship between mankind and nature. The ancient text of Ayurveda reports more than 2,000 plant species for their therapeutic potentials. Besides Ayurveda, other traditional and folklore systems of health care were developed in the different time periods in Indian subcontinent, where more than 7,500 plant species were used.

According to a WHO estimate, about 80 percent of the world population relies on traditional systems of medicines for primary health care, where plants form the dominant component over other natural resources.

Wider Use

Several drugs viz. reserpine, quinine, digoxin, ephedrine, cocaine, emetin, khellin, colchicine, artemisinine, gugulipid etc. have been derived from the plants which pay important ethnomedical role in tribal societies. *Lobelia inflata* smoked earlier by Indian tribal people, is now used as a substitute for Tobacco. *Podophyllum peltatum,* formerly used by tribals to remove skin warts is now used in treating uterine warts in modern system of medicine (Singh and Pandey, 1998). Moreover, out of 120 active compounds currently isolated from higher plants and used in modern medicine, 74 per cent have positive correlation between the modern therapeutic use and the traditional use of the plant from which they were derived or discovered. Several other tribal medicine have also been incorporated in the organised system of medicine and some more miraculous medicine known to the tribal communities are still secrets of certain families.

Tribal Welfare

Tribal, Adibasi, Girijan, Vanvasi, Janjati, Vanyajati, Adim jati, Aboriginal etc. are the words synonymous to each other. Such distinct ethnic groups are mentioned as Scheduled Tribes, in Article 342 of Constitution of India.

India has been rightly called as a "Melting Point" of races and tribes. It is one of the richest countries in ethnomedicinal and biodiversity point of view due to the presence of multiethnic groups of ancient lineage. The country presents a colorful mosaic of about 500 tribal communities representing 7.76 per cent of the total population, spread over 19 per cent of total area of the nation (Singh & Pandey, 1998).

Their entire style of the life revolves around the forest. Their knowledge about medicinal usage of plants has survived only by oral communications from generation to generation. The field studies among such societies for advancing our knowledge of medicinal plants are of great importance.

All in all, through our above attempts, we fully succeeded in deriving information especially as to how they have been utilising the plant wealth of the forest in the vicinity of their villages, for their own welfare. This has really widened the horizon of the knowledge since the village people have been using, either complete plants or their specific organs for curing a series of 15 kinds of diseases ***Table-1*** like Fever, Cough, Skin diseases, Cardiovascular problems, Gastrointestinal troubles, Problems of male and female reproductive system etc.

Along with Botanical names, Common/ Vernacular names and Family name ***Table-2*** revealed that different parts of the plants such as the roots and other underground parts, flowers, flower buds, fruits, seeds, gums, resins are variously utilised by the tribal people for curing the ailment.

Table 2 is segregated disease wise in to different sections. As much as 129 ways are listed which tribes of this region using approximately 77 plants species are belonging to 45 families of Angiosperm. Along with 40 families of Dicotyledons, member species of 5 families of Monocotyledons viz. Arecaceae, Cyperaceae, Liliaceae, Musaceae and Poaceae are used by tribal people for the treatment of diseases. It is very clear from the Table that approximately 20 plant species of both Dicot and Monocot are consumed by tribes for the treatment of more than one kind of disease. Species like *Allium cepa, A. sativa, Acacia nilotica, Albizia lebbek, Ficus benghalensis, F. religiosa, Terminalia chebula* are commonly used for treating more than four type of ailment, hence valued by Bhopas or persons practicing Indigenous

Table-1: Use of Plants for Medical Purposes

Sr. no.	Ailments	No. of species being used
1	Fever	05
2	Cough	05
3	Eye Ailment	05
4	Ear troubles	03
5	Dental troubles	05
6	Tuberculosis	05
7	Skin Diseases	14
8	Brain related problems	08
9	Stomach Diseases	09
10	Piles	06
11	Heart Diseases	03
12	Male Reproductive system	19
13	Female Reproductive System	19
14	Remedies against Poison Consumption	16
15	Diabetes cure	06

Table-2: Statement of the Utilisation of the various Plant Species for Curing Ailments

Sr. No.	Botanical Names	Families	Common/ vernacular Names	Parts Used
	Fever			
1	Cordia dichotoma var.wallichii (C.) Maheshwari	Ehretiaceae	Lasora	Bark
2	Cynodon dactylon (L.) Pers	Poaceae	Dub	Entire plant
3	Moringa oleifera Lamk.	Moringaceae	Sahjan	Roots
4	Nyctanthes arbor-tristis L.	Oleaceae	Harsingar	Leaves
5	Terminalia chebula Retz.	Combretaceae	Harad	Fruit powder
	Cough			
6	Adhatoda vasica Nees	Acanthaceae	Vasak, Arusa	Leaves
7	Allium sativum L..	Liliaceae	Lahsun	Extract of bulb
8	Cordia dichotoma wallichii (C.) Maheshwarii	Ehretiaceae	Lasoda	Fruit with seeds
9	Ficus religiosa L..	Moraceae	Peepal	Fruits
10	Terminalia belirica (Gaertn.) Roxb.	Combretaceae	Bahera	Fruit, seed-coat
	Eye Ailments			
11	Acacia nilotica (L.) Willd.	Mimosaceae	Babool	Leaves
12	Albizia odoratissima L..f.	Mimosaceae	Kala siris	Leaves
13	Allium cepa L..	Liliaceae	Pyaj	Extract of bulb
14	Boerhaavia diffusa L..	Nyctaginaceae	Punarnava	Root
15	Ficus benghalensis L..	Moraceace	Burh, vat	Latex
	Ear Troubles			
16	Allium cepa L..	Liliaceae	Pyaj	Extract
17	A. satvium L..	Liliaceae	Lahsun	Extract of bulb
18	Acacia nilotica (L.) Willd.	Mimosaceae	Babool	Leaves
	Dental Troubles			
19	Albizia lebbek (L..) Benth.	Mimosaceae	Kala siris	Leaves
20	Euphorbia neriifolia auct, pl. non. L..	Euphorbiaceae	Thuhar Chhota	Extract of entire plant
21	Ficus benghalensis L..	Moraceae	Bargad, Bad	Latex, Fruit
22	Helianthus annuus L..	Asteraceae	Surajmukhi	Seed oil
23	Syzygium aromaticum (L.) Merr. & Perry	Myrtaceae	Laung	Bud, Clove oil
	Tuberculosis			
24	Adhatoda vasica Nees	Acanthaceae	Vasak, Arusa	Leaves
25	Allium sativum L..	Liliaceae	Lahsun	Bulb
26	Dendrocalamus strictus (Roxb.) Nees	Poaceae	Laathibans	Alcoholic extract
27	Elettaria cardamomum Maton	Zingiberaceae	Chhoti elaichi	Alcoholic extract
28	Tinospora cordifolia (Willd.) Miers. ex Hook. F. & Thoms.	Menispermaceae	Giloe	Alcoholic extract
	Skin Diseases			
29	Albizia lebbek (L.) Benth.	Mimosaceae	Siris	Bark
30	Allium cepa L..	Liliaceae	Pyaj	Extract of Bulb
31	A. satvium L..	Liliaceae	Lahsun	Extract of bulb
32	Annona squamosa L..	Annonaceae	Sharipha	Leaves
33	Azadirachta indica A. Juss.	Meliaceae	Neem	Leaves, Bark
34	Buchnania lanzan Spreng.	Anacardiaceae	Chironji	Seeds
35	Crotalaria juncea L..	Fabaceace	Sanai	Leaves
36	Cynodon dactylon (L..) Pers	Poaceae	Doob	Entire plant
37	Dalbergia sissoo Roxb.	Fabaceace	Sheesham	Oil,Leaves
38	Datura stramonium L..	Solanaceae	Dhatura	Fruits
39	Ficus religiosa L..	Moraceae	Peepal	Bark
40	Mangifera indica L..	Anacardiaceae	Aam	Leaves
41	Nicotiana tabacum L..	Solanaceae	Tambaku	Leaves
42	Terminalia chebula Retz.	Combretaceae	Harad	Fruits, Leaves
	Brain Related Diseases			
43	Acorus calamus Linn.	Araceae	Bach	Powder
44	Albizia lebbek (L..) Benth.	Mimosaceae	Siris	Seeds

45	Bacopa monnieri (L.) Pennell	Scrophulariaceae	Nira-Brahmi	Plant extract
46	Cynodon dactylon (L..) Pers.	Poaceae	Doob	Entire plant
47	Evolvulus alsinodes	Convolvulaceae	Shankh-pushpi	Extract
48	Moringa oleifera Lamk.	Moringaceace	Sahjan	Flower buds
49	Pongamia pinnata (L..) Pierre	Fabaceace	Karanj	Seeds
50	Terminalia chebula Retz.	Combretaceae	Harad	Fruits, Seeds
	Stomach Diseases			
51	Acacia nilotica (L..) Willd.	Mimosaceae	Babool	Bark, Seeds
52	Albizia lebbek (L..) Benth.	Mimosaceae	Siris	Extract of leaves and twigs
53	Boerhaavia diffusa L..	Nyctaginaceae	Punarnava	Root
54	Cinnamomum tamala (Buch. Ham.)	Lauraceae	Tejpat	Bark
55	Euphorbia tirucalli L..	Euphorbiaceae	Sehund	Latex
56	Ficus religiosa L..	Moraceae	Peepal	Aqueous extract of the bark
57	Operculina turpethum (L..) Silva Manso	Convolvulaceae	Nisoth	Root, bark
58	Terminalia belirica (Gaertn.) Roxb.	Combretaceae	Baheda	Fruit, Seed
59	T. chebula Retz.	Combretaceae	Harad	Fruit, Seed
	Piles			
60	Allium cepa L..	Liliaceae	Pyaj	Bulb
61	Cynodon dactylon (L..) Pers.	Poaceae	Doob	Stem
62	Ficus benghalensis L..	Moraceae	Vat, Bargad	Latex, aerial roots
63	Plumbago zeylanica L..	Plumbaginaceae	Chitrak	Root, milky juice
64	Pyrus pyrifolia (Burm.F.) Nakai	Rosaceae	Nashpati	Fruit pulp
65	Thespesia populnea (L..) Soland. ex. Corr.	Malvaceae	Paras Peepal	Seed, Young buds, flowers
	Heart Diseases			
66	Bacopa monnieri (L..) Pennel	Scrophulariaceae	Nira-Brahmi	Whole plant extract,leaves
67	Terminalia arjuna (Roxb.) W. & A.	Combretaceae	Arjun	Bark
68	Tinospora cordifolia (Willd.) Miers. ex Hook. F. & Thoms	Menispermaceae	Giloe	Stem extract
	Ailments of the Male Reproductive system			
69	Acacia nilotica (L..) Willd.	Mimosaceae	Babool	Bark, Thorn
70	Acorus calamus Linn.	Araceae	Bach	Rhizome
71	Albizia lebbek (L..) Benth.	Mimosaceae	Siris	Bark
72	Allium cepa L..	Liliaceae	Pyaj	Bulb
73	Asparagus racemosus Willd.	Liliaceae	Shatavar	Root Juice
74	Butea monosperma (Linn.) Taub.	Fabaceace	Palash, chhola	Gum
75	Catharanthus roseus (L..) G. Don	Apocynaceae	Sada Vahar	Roots
76	Ceiba pentandra L..	Bombacaceae	Semal	Roots
77	Chlorophytum borivilianum Sant.	Liliaceae	Safed musli	Rhizome
78	Curculigo orchiodes Geartn.	Hypoxidaceae	Kali musli	Stem
79	Ficus benghalensis L..	Moraceae	Vat, Bargad	Bark,Latex
80	F. religiosa L..	Moraceae	Peepal	Bark,Latex
81	Hygrophila auriculata (Schum.)	Acanthaceae		Leaf, Seed, Root
82	Mucuna prurita Hook.	Fabaceace	Kaunch, Kavanch	Seed
83	Peganum harmala L..	Zygophyllaceae	Gokhru	Seeds
84	Phoenix sylvestris (L..) Roxb.	Arecaceae	Khajuri	Fruits
85	Rhinacanthus nasuta Kurz	Acanthaceae	Palak juhi	Leaves, roots, seeds
86	Tamarindus indica L..	Caesalpiniaceae	Imli	Pulp of the fruit
87	Terminalia chebula Retz.	Combretaceae	Harad	Fruit
	Ailments of the female Reproductive system			
88	Acacia nilotica (L..) Willd.	Mimosaceae	Babool	Bark powder, Seed powder
89	Acorus calamus Linn.	Araceae	Bach	Stem extract
90	Anogeissus pendula Edgew	Combretaceae	Dhaura,Dhav	Bark
91	Azadirachta indica A. Juss.	Meliaceae	Neem	Gum of the stem

92	Butea monosperma Taub.	Fabaceace	Palash, Chhola	Gum of the stem, Bark
93	Crocus sativus L..	Iridaceae	Kesar	Petal, steman
94	Crotalaria juncea L..	Fabaceace	Sanai	Seeds
95	Cyperus scariosus R. Br.	Cyperaceae	Nagarmotha	Rhizome
96	Phyllanthus embilica Linn.	Euphorbiaceae	Anola, Amla	Fruit
97	Ficus benghalensis L..	Moraceae	Vat, Bargad	Arial root, young leaves
98	Ficus glomerata Roxb.	Moraceae	Gular	Fruit
99	F. religiosa L..	Moraceae	Peepal	Fruit
100	F. rumphii Blume	Moraceae	Pakhar	Fruit
101	Musa paradisiaca L..	Musaceae	Kela	Fruit
102	Drypetes roxburghii Wall.	Euphorbiaceae	Putranjiv	Bark
103	Tectona grandis L..f.	Verbenaceae	Sagwan	Secondary wood
104	Terminialia belerica (Gaertn.)Roxb.	Combretaceae	Behda	Fruit,Seed
105	T. chebula Retz.	Combretaceae	Harad	Fruit,Seed
106	Tribulus terrestris L..	Zygophyllaceae	Gokhru	Fruit,Leaves,root
	Remedies against Poison Consumption			
107	Albizia odoratissima Benth.	Mimosaceae	Kali siris	Gum of the stem
108	Allium cepa L..	Liliaceae	Pyaj	Bulb extract
109	Brassica juncea(L.) Gaertn. & Coss.	Brassicacaeae	Rai	Seeds
110	Butea monosperma Taubert.	Fabaceace	Palash	Stem gum
111	Cordia dichotoma wallichii (C) Maheshwari	Ehretiaceae	Lasoda, Labheda	Fruit
112	Gossypium hirsutum L..	Malvaceae	Kapas	Seeds
113	Heliotropium indicum L..	Boraginaceae	Hatta Juri	
114	Leptadenia pyrotechnia (Forsk.) Dence	Asclepiadaceae	Khip	Stem
115	Malus pumila Mill.	Rosaceae	Seb	Fruit pulp
116	Mangifera indica L.	Anacardiaceae	Aam	Fruit pulp,Leaves
117	Michelia champaca L.	Magnoliaceae	Champaca	
118	Piper nigrum L.	Piperaceae	Kali mirch	Fruit
119	Salvadora persica L.	Salvadoraceae	Pilu	Leaf, Root,Fruit
120	Sesamum indicum L.	Pedaliaceae	Til	Seed, leaves
121	Tephorsia purpurea (L.) Pers.	Fabaceace	Sarphonka	Leaf, Leaf powder
122	Tinospora cordifolia (Willd.) Miers. ex Hook. F. & Thoms	Menispermaceae	Giloe	Aerial stem extract
	Cure for Diabetes			
123	Aegle marmelos (L.) Corr.	Rutaceae	Bael	Fruit pulp
124	Azadirachta indica A. Juss.	Meliaceae	Neem	Fruit, seed
125	Ficus glomerata Roxb.	Moraceae	Gular	Fruit
126	Gossypium hirsutum L.	Malvaceae	Kapas	Seed
127	Pterocarpus marsupium Roxb.	Fabaceace	Bijasal	Gum, Flower,Seeds
128	Syzygium cumini (L.) Skeels	Myrtaceae	Jamun	Fruit, seed

system of medicine in these Districts of Rajasthan.

It is also observed during the screening of results that these tribal people are more aware with the diseases related with skin, male reproductive system, female reproductive system and poisoning and the nature as well as utility of plants growing in their vicinity, hence using an array of plant species for these diseases.

People-Centric Research

Any research on indigenous knowledge, therefore, must focus on people's assertions and aspirations for national development. Regulatory forest management strategies do not correspond any longer to the political reality. Social and political processes at the level of communities reflecting different interests in forests require more attention in policy analysis. National regulation can only be successful if they are meaningful to and accepted by indigenous people. At the global level, forests have become part of worldwide concern and subject to political efforts in order to develop a more consistent cooperation on their management.

It could be concluded with the above observations that the tribal population living in and around the forest, which is heavily depended upon forest for its daily need viz. fuel wood, food, fodder etc., is able to maintain its health and problems related with diseases with their time tested wealth of information.Their entire style of the life revolves around the forest. Their knowledge about medicinal usage of plants has survived only by oral communications from generation to generation. The field observations among such societies for advancing our knowledge of medicinal plants are of great importance.

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Saffron Mission to Improve Farmers Lot

The recently launched Saffron Mission in Kashmir is expected to give a big boost to the crop saffron farmers. In the light of the development, some reflections on the priced crop will be appropriate.

In India the valley of Kashmir is famous for saffron which is an important cash crop. Since it is very expensive, unscrupulous dealers often adulterate it. So one has to be very careful while buying saffron and should never buy it from roadside hawkers.

In order to understand commercial saffron, it is important to know the make-up of the saffron plant. Commercial saffron comes from the bright red stigmas of the *Crocus Sativus*. The stigmas are the female part of the flower. In a good year each saffron crocus plant might produce several flowers. Each flower contains three stigmas which are only part of the saffron crocus that when dried (cured) properly, become commercial saffron. Each red stigma is like a little capsule that encloses the complex chemicals that make up the saffron's aroma, flavour and yellow dye. In order to release these chemicals the threads are to be steeped.

Saffron is native to Southern Europe but was known to the ancient Greeks and Romans. Saffron was imported to England from the East many centuries ago, and was once grown extensively round Saffron Walden, in Essex, UK. One smoke-pervaded spot in the heart of London still bears the name 'Saffron Hill'. This herb is now cultivated in Mediterranean countries, particularly in Spain, and also in Austria, France, Greece, England, Turkey, Persia, India and China. The La Macha belt of Spain is the largest producer of saffron in the world and contributes 80-90 percent of the world saffron production. In India the cultivation of saffron is confined to Pampore and Kistwar areas of Jammu and Kashmir, extending to nearly 4000 acres.

Nature of Saffron

Saffron is a small bulbous perennial plant with the botanical name of *Crocus sativus Linn*. The low growing plant grows 15 to 25 cm high and has an underground globular corm. It is mainly cultivated for its large, scented, blue or lavender flowers. The flowers of saffron plant have divided, orange coloured stigmas, which along with the style-tops yield the saffron of commerce. The flowering period of saffron starts during middle or late October and lasts only until the first or second week of November. However, the number of saffron flowers and the time of blooming in any year are dependent upon the temperature prevalent in spring and autumn and upon the amount of rainfall.

Saffron is known by different names in various Indian languages. In Sanskrit, the plant is named as *Keshara*, *Kunkuma*, *Aruna*, *Asra* and *Asrika*. The Hindi and Punjabi names of the plant are Zaffran and Kesar and it is called as Zaffran in Bengali. The Gujarati speaking people know the plant as Keshar, while in Kannada it is called as Kunkuma Kesari. In Kashmiri, saffron is known as Kong and the Marathi speaking people call it as Kesar and Kesara. While it is called as *Kungumapu* in Tamil, the Telugu name of saffron is *Kunkumapuva*. In Urdu it is popular as Zaffran and Jafranekar.

Cultivation

The state of Jammu & Kashmir is the place where saffron is predominately cultivated in India. In fact, Kashmir is considered one of the three prominent cultivating places of saffron all over the world. The state of Himachal Pradesh is also counted among the premium cultivating places of saffron in India. The ideal environment for cultivation of saffron is cool dry climate and rich soil with excellent drainage and organic content. India is one of the premium producers and exporters of top-grade 'coupe' saffron around the world.

Saffron is also used quite extensively for self-consumption in different parts of

Saffron has a bitter taste and a penetrating aromatic odour. It can be added to various food items for colouring, flavouring and also for taste. In fact, saffron is considered one of the oldest and most expensive spices in the world

India. There are three grades of saffron available in Indian market and they are known as Shahi Saffron, Mogra saffron, and Lachha Saffron.

There are in general two main types of saffron spices. One is the saffron that is used to add colour and the other type of saffron is used to give both the colour and the unique flavour of saffron. Spanish saffron and Iranian saffron make up 80 percent of the world saffron production.

Uses

Saffron has many uses. In India, it is frequently used for culinary and medicinal purposes. In ancient period, the Kashmiri saffron was used as a fabric dye and for treating depression. Saffron stigmas were soaked in water to yield a golden-yellow solution and were then used as a fabric dye. The usable saffrons are produced by drying the stigmas and part of the styles of the purple autumn crocus. Saffron has a bitter taste and a penetrating aromatic odour. It can be added to various food items for colouring, flavouring and also for taste. In fact, saffron is considered one of the oldest and most expensive spices in the world. For its unique aromatic feature, saffron is commonly used in preparing food items like baked goods, cheeses, confectionaries, curries, liquors, meat dishes, and soups, etc.

In pharmaceutical industry 125 gram of pure saffron essence is enough for making 300 million sedative tablets.

As a therapeutically plant, saffron is considered an excellent stomach ailment and an antispasmodic, helps digestion and increases appetite. It is also relieves renal colic, reduces stomach-aches and relieves tension. It used as a drug for flu-like infections, depression and as a sedative for its essential oils. It is also considered that in small quantities it regulates women's menstruation, and helps conception.

Saffron is given to reduce fevers, cramps and enlarged livers, to calm nerves. In the western world it is used primarily as a spice. But it is also discovering its uses as a health tonic, which naturally does not have side effects. About 50 mg of Saffron dissolved in a glass of 200ml milk and a spoonful of sugar makes a very tasty drink, which is also a health tonic. A regular intake of this every day for a period of time enables the body to build resistance against a lot of common diseases such as Asthma, Common colds claim Ayurvedic Practitioners. But beware; do not to expect it to act as a magic potion because it is essential to have a regular intake for it to be effective.

a) Saffron in Western Medicine:

1) The Ebers Papyrus (Ca 1550 BC) has mentioned it as an ingredient in case of kidney problems
2) Due to the presence of crocetin it indirectly helps to reduce cholesterol levels in the blood

Great Legacy

Persian invasion and colonisation of Kashmir probably started saffron cultivation in Kashmir. Kashmiri saffron was marketed as a dye and treatment for melancholy. Buddlist monks in India adopted saffron coloured robes after the death of Gautama Buddha. Around 3rd century A.D, (probably), the Chinese knew about saffron cultivation in Kashmir. Wan Zhen, a Chinese medical expert reported that Kashmiri people grew it to offer it to Buddha.

Saffron grows to a height of about 45 cms. The flower blossoms in beautiful colours. Each flower contains three stigmas. Reproduction is dependent on human assistance: the corms (underground bulb-like starch-storing organs) must be manually dug up, broken apart, and replanted. A corm survives for only one season, reproducing via division into up to ten "cormlets" that eventually give rise to new plants. The corms are small brown globules up to 4.5 cm in diameter and are shrouded in a dense mat of parallel fibers.

Saffron contains more than 150 volatile and aroma yielding compounds. It also has many non volatile active components. Its golden – yellow – orange colour is primarily the result of a carotenoid pigment crocin (alpha crocin), that may comprise more than 10 percent of dry saffron mass.

The Chemical Composition of Saffron

Carbohydrates – 12 to 15 percent

Water – 9 to 7 percent

Polypeptides – 11 to 13 percent

Cellulose – 4 to 7 percent

Miscellaneous (Non – nitrogenus) – 40 percent

Production of saffron

World production of saffron is 300 tonnes per annum.

Saffron crocus Yield (kg per hectare)

Spain 6 – 29

Italy 10 – 16

Greece 4 – 7

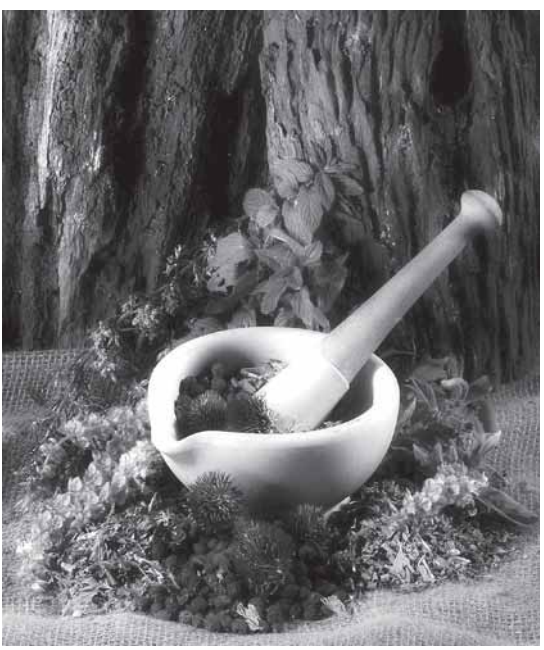
India 2 – 7

Moroco 2 – 2.5

3) Two compounds in Saffron are supposed to increase anti-bacterial and anti-viral physiological activity in the body.

4) In the USA it was given to children in exanthematous diseases for promoting eruptions.

5) Based on Urdang's reports and records of Ancient and Medieval periods indicate anti tumour & anti cancerous activities.



b) Saffron in Eastern Medicine

In the East, saffron is as a medicinal cure and preventive. According to the Central Council for Research in Ayurveda and Sidhha (Ministry of Health and Family Welfare) it useful in

1) Curing *Asthma* Cough

2) Useful in treating Colds

3) For treating Alcoholism

4) To treat Acne and Skin Diseases.

5) Used in medicines that reduce inflammation

6) For treatment of enlarged Liver and infection of Urinary Bladder and Kidneys

7) As an ingredient in recipes useful in Menstrual disorders

8) For strengthening the heart and as a refrigerant for the brain

9) As a diuretic if soaked overnight in water and administered with honey

10) Pounded with clarified butter (Ghee) it is used for treating diabetic patients.

11) It can be use to make the gum pain, relax.

12) The mixture of saffron with olive oil use for curing the hurt muscles.

Cosmetic Uses

Traditionally saffron is believed to promote fairness of the complexion. It is widely used in cosmetics, especially in fairness creams. It is an age-old belief that pregnant women give birth to 'fair' babies, if they consume saffron.

Side Effects

As with any medication or herbal supplement, side effects are possible with saffron. Although some people assume that natural products (such as saffron) are automatically free of side effects, this is simply not the case. Remember, many poisons and toxins are natural products. In most cases, side effects of saffron are merely bothersome, although some can be serious.

- An increase or decrease in appetite
- Drowsiness
- Nausea

Check on Saffron Smuggling

Government of India will look into the issue of smuggling of saffron from other countries into India. This was stated by Agriculture Minister Sharad Pawar on 27 October said that since this issue of saffron smuggling and imports without adequate duties has been raised, we will look into this serious matter. Pawar was replying to a at the Economic Editors' Conference in New Delhi on the government of India's policy in allowing saffron imports and not checking its smuggling into the country.

Responding to the point that the price slide of Kashmir saffron had seriously impacted the livelihood of thousands of farming families, B K Basu secretary department of Agriculture and Cooperation said that the Saffron Mission Project launched in Jammu and Kashmir will help in checking the imports and the smuggling.

"We believe the Saffron Mission will help in improving productivity of saffron and the net area under its cultivation. That in turn will help to check the smuggling", Basu added.

On the steps to be taken beyond the Saffron Mission project to curb smuggling, Basu emphasised that "market forces will themselves take care of the problem once the Mission is fully implemented. Kashmir's saffron is not only a commodity but a heritage. It is the best saffron in the world, and we accord high priority to its growth and progress", he added.

Pawar said the Plan outlay for the Agriculture and allied sector has increased substantially from Rs.7, 431crore in 2006-07 to Rs.19, 070 crore in 2010-11, an increase of about 156 percent.

Saffron is rightly called the magical herb. It has varied uses ranging from culinary to medicinal and beauty and has been highly valued by man since ancient times.

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AGRI NEWS

Sugar Decontrol Talks in November: Pawar

The Union Agriculture Ministry will start discussions on decontrol with all the sugarcane-producing states, including Maharashtra and Uttar Pradesh in November. Union Agriculture Minister Sharad Pawar stated that the allotment for sugar export would be decided around mid-November, once the precise amount of country's surplus is clearly documented.

Sharad Pawar has taken a supportive stand on sugar exports in line with the demand of producers and mill owners that it to be brought under open general license (OGL). Pawar said time was ripe for this with global sugar prices around US$693 a tonne and domestic sugar production estimated at 25 million tonnes. He said he would ignore the opposition to exports and take a decision.

"Sugar prices in the global market are quite high and this is the right time for exports. I am of the view that cane farmers and mills should benefit from high prices," Pawar was quoted in the press. The Centre has allowed advanced licence export obligation of about one million tonnes for exports. Exports under OGL were banned in February 2009 in the wake of a fall in sugar output to 14.7 million tonnes in 2008-09. The 2009-10 output was 19 million tonnes. Following a rise in sugar production this season, the National Federation of Cooperative Sugar and the Indian Sugar Mills Association have demanded option for exports.

Mills say there was a mismatch of around Rs 250 a quintal between the production cost and the selling price. The realisation is estimated at Rs 2,450 a quintal while the production cost is Rs 2,700 per quintal. They say pressure on them will be eased if they are allowed to export.

Pawar said he faced opposition when he allowed cotton exports. Those who opposed cotton exports argued that cotton mills would be forced to buy at higher prices. "However, due to cotton exports, farmers benefited and got Rs 4,200 a quintal," he said.

Addressing a gathering in Ahmadnagar district, the Union minister told millers to become more professional in carrying out operations while hinting that the time had come for sugar decontrol and millers should be ready to face global competition.

Fertiliser Companies not to Hike Prices

Fertiliser firms may refrain from raising prices during the ensuing Rabi season. It is reported that the industry has agreed to observe status quo in di-ammonium phosphate (DAP) and muriate of potash (MOP). Only complex fertilisers may see some upward revision of prices. It might be Rs 10-15 a bag, which comes to Rs 200-300 a tonne, according to sources.

The Centre has technically de-controlled prices of all non-urea fertilisers with effect from 1 April as part of ushering in a nutrient-based subsidy (NBS) regime. That gives companies the liberty to fix farm gate prices, based on supply-and-demand conditions and receipt of a fixed per tonne subsidy linked to their products' nutrient composition.

For the current Kharif season, firms had hiked prices of DAP, MOP and various complexes – containing different proportions of nitrogen, phosphorous, potash and sulphur (N:P:K:S) – by Rs 600 to Rs 700 a tonne. Even in the case of urea – which is outside the purview of the NBS – the Centre increased the maximum retail price (MRP) from Rs 4,830 to Rs 5,310 a tonne.

For 2010-11, the Centre has provided Rs 49,980.73 crore towards fertiliser subsidy, as against Rs 52,980.25 crore in the preceding fiscal. According to the sources, the budget estimate may overshoot primarily for two reasons. The good monsoon along with remunerative prices for most crops has boosted fertilizer demand. This year, total fertiliser material consumption is likely to go up by at least 10 percent to top 58 million tonnes (mt) – 28 mt urea, 12 mt DAP, 9-9.5 mt complexes, 5 mt MOP, 3 mt single super phosphate and 0.5 mt of others.

Maenwhile, India's fertiliser companies may receive Rs 1,400 crore from the finance ministry. The ministry has given an in-principle nod for this funding and the clearance from Cabinet Committee on Economic Affairs (CCEA) is awaited. This funding will be to compensate the fertilisers firms who failed to earn profit from bonds worth Rs 27,500 crore in 2007-08 and 2008-09 fiscals issued by the finance ministry.

AGRI NEWS

Agri Loans from Micro finance Firms

Hydeabad-based microfinance company, Spandana, has scaled up its agri-family loans called Dharini given to small, marginal and tenant farmers for agricultural purpose.

Spandana is a registered non-banking finance company and is regulated by RBI. It offers micro-credit and credit plus services to customers across 12 states in India. Till September 30th, the company has disbursed over Rs 500 crores to farmers. By reducing its interest rate charged on the loans to 21 percent from 24 percent in the previous year, the company offers the lowest priced micro-loans in the industry. The agri-family loan product has reached out to over 1.4 lakh households till date.

"We are leveraging our existing network and passing on the benefits to our borrowers", said Mrs. Padmaja Reddy, managing director, Spandana. It is also planning an IPO shortly.

Food Security Spending will Rise by Rs 72,000 Crore

The proposed food security proposal recommended by the National Advisory Council (NAC) to guarantee food grain to two-thirds of the country's population, could bloat the government's food subsidy spend by 26 percent to over Rs 72,000 crore. This will be equivalent to over 1 percent of the gross domestic product. The food grain guarantee is part of the proposed National Food Security Bill. This is just a conservative figure compared to the Rs 78,000 crore estimated by Deutsche Bank in a recent research report. India's food subsidy bill in 2009-10 was estimated at Rs 55,600 crore. Over and above this, the government will have to bear the cost of supplying grain to the poorest sections of society under the Antyodaya Anna Yojna (AAY) and other welfare schemes.

The priority will be entitled to 35 kg of wheat, rice and millets at Rs 2, Rs 3 and Rs 1 a kg, respectively. General households will be entitled to 20 kg at a price not exceeding half the minimum support price. The two categories together would require 62.1 million tonnes of foodgrain, annually, according to Agriculture Minister Sharad Pawar. That is more than the record government procurement of 56.83 million tonnes in 2009-10.

Agricultural analysts are also questioning the viability of the food security legislation recommended by NAC. "It would be difficult to produce such huge quantities and the government will have to crowd out the entire private sector from procurement. That is going to be a major challenge," said Ashok Gulati, Asia director of the International Food Policy Research Institute.

FICCI Hails Private Sector in Agriculture

A recently released FICCI report has highlighted that in the last 15 years, Indian agriculture has witnessed a vibrant and dynamic participation by the private sector. Private initiatives in agriculture currently span across a variety of crops, regions and are operational by both big and medium-sized organisations.

The report – '*Corporate Intervention in Indian Agriculture: Towards a Resilient Farming Community'* charts FICCI aims to broad base the knowledge about corporate initiatives in augmenting agriculture growth and hopes that such public-private partnerships can help improve the level of agriculture and farmers' living standard.

Releasing the report, Union Minister for Food Processing Industries Subodh Kant Sahai appealed to the companies in the food industry to set up a parallel business dedicated to upgrade the agriculture and food processing industry and invest at least five percent of its turnover in the business. This would encourage the corporates to help the farmers increase their yields and take to market-driven farming practices.

Alongside the release of the report, Bharti Wal-Mart announced its plans to buy agriculture produce directly from 35,000 small and medium farmers in India by the end of 2015 and create its third education and training centre in Bangalore soon. Unfolding Bharti Wal-Mart's plans at the event, Mike Duke, president and CEO, Wal-Mart Stores Inc, said under the Direct Farm Programme in India, Bharti Wal-Mart proposes to bring in the best farm management practices and train small- and medium-sized farmers to grow more with less water and optimum utilisation of fertilisers and pesticides.

Duke added that under the Special Skills Training Programme, Bharti Wal-Mart has set up two training centres – one in Punjab and the other in Delhi.

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