ESSAYS ON PRIMARY SECTOR

DROUGHT PROFILE OF HARYANA

By Suraj Bhan Dahiya, Research Officer

Meterologically drought over an area or place may be defined as a situation when annual rainfall in that area or place is less than 75 percent of the normal rainfall. It is further classidied as 'Moderate Drought' if rainfall deficit is between 25 and 50 percent and 'Severe Drought' when it is more than 50 per cent. Areas where frequency of drought as defined above is 20 per cent of the years examined, are categorised as 'Drought Areas' and areas having drought conditions for more than 40 per cent of the years under consideration represent 'Chronically Drought Affected Areas'.

History of droughts and famines of Haryana region goes back to the Sultanate period. Since then, droughts and famines have been the regular phenomena in the state. The first famine of which we have any authenic account is that of A.D. 1783, the **Chalisa Kal** or famine of **San Chalis** (Samvat 1840). From the stories told by older village folk, there seems little doubt that the **Chalisa** famine was by far the most severest in the famine history of Haryana region. The famines of 1860-61, 1869-70, 1896-97 and 1899-1900 were a few other severe famines which occurred in the State during the earlier centuries. Famine is now only a past event however, drought continues to throb the state. During the 87 years period from 1901 to 1987 drought conditions a prevailed over Haryana has been studied deeply. Probabilities of occurrence of low rainfall based on co-efficient of variation of rainfall reveal that the South-Western parts of Haryana have been more prone to famines and droughts. The occurences of droughts in different districts during the last 87 years have been given below :—

Districts		Frequency of droughts in Years	Rainfalls data available for the years
1		2	3
1.	Hisar	18	86
2.	Rohtak	23	78
3.	Gurgaon	18	77
4.	Karnal	15	79
5.	Mahendragarh	22	78
6.	Jind	20	71
7.	Ambala	12	86
8.	Kurukshetra	20	77
9.	Sonipat	15	77
10.	Sirsa	24	73
11.	Bhiwani	22	77
12.	Faridabad	17	77

The districts of Ambala, Sonipat, Karnal Faridabad experienced the drought conditions less than 20 percent of the years under consideration and therefore, are not categorised drought areas, while the district of Hisar, Gurgaon amd Kurukshetra satisfy

mariginally the criterion for being classed as 'Drought Areas' and oscillate in between 'Drought Areas' and Non-drought Areas'. Other districts may be termed as drought areas.

Cycle of drought conditions in successive years is very swift in Haryana state. Severity drought not only depends upon the order of rain fall deficiency in a single year, but also depends upon the continued occurrence of deficient rain in successive years, even though the defici-ency to each successive years may not be as high as in single year. The following table gives the years of successive drought in various districts based on the available rainfall data :—

Years of successive drought	Districts affected
1	2
1901—02	Hisar, Jind, Sirsa, Bhiwani
1901— 03	Rohtak, Sonipat
1901— 05	Jind
1902— 03	Mahendragarh, Jind
1904— 05	Jind, Kurukshetra
1911— 12	Jind
1920— 21	Hisar, Kurukshetra, Sirsa
1921— 22	Jind
1927— 28	Sirsa, Jind
1927— 29	Jind
1928— 29	Gurgaon, Ambala, Faridabad, Jind
1928— 30	Karnal
1934— 35	Rohtak
1937— 38	Faridabad
1937— 39	Gurgaon
1937— 41	Mahendragarh
1938— 39	Hisar, Kurukshetra, Jind
1938— 39	Jind, Sirsa
1938— 41	Rohtak, Karnal, Sonipat, Bhiwani
1943— 44	Rohtak, Jind
1949—51	Bhiwani
1950— 51	Mahendragarh
1951— 52	Faridabad
1968— 69	Sirsa
1982— 83	Sirsa, Bhiwani, Rohtak, Mahendragarh
1987— 88	Whole of Haryana.

To go further, if rain fall is less than 50 per cent of the annual normal rainfall, it causes severe drought conditions. This situation experienced in some of the districts of the state has been recorded the following table. The actual rain fall in each district expressed as the percentage of the respective normal rainfall has also been mentioned in brackets :—

Years	Districts affected
1	2
1901	Bhiwani (49), Sirsa (41), Jind (42)
1902	Jind (40), Sirsa (45)
1904	Jind (45)
1905	Rohtak (30), Mahendragarh (33), Jind (45)
1915	Sirsa (47)
1918	Rohtak (38), Gurgaon (33), Karnal (45) Mahendragarh (25), Jind (47),Ambala (44), Sonipat (43), Bhiwani (43), Faridabad (26)
1920	Hisar (45), Sirsa (34)
1921	Mahendragarh (45)
1927	Jind (19)
1928	Gurgaon (47), Jind (22)
1929	Rohtak (49), Jind (28), Sonipat (48), Bhiwani (48), Faridabad (46)
1938	Hisar (28), Rohtak (32), Mahenderagarh (38), Jind (39), Kurukshetra (49), Sonipat (42), Faridabad (47)
1939	Rohtak (31), Karnal (42), Mahendragarh (39), Jind (33), Sirsa (46)
1941	Mahendragarh (37)
1949	Bhiwani (47)
1951	Mahendragarh (48), Bhiwani (47))
1968	Hisar (37), Sirsa (43)
1972	Kurukshetra (48)

It may be seen that the lowest rainfall expressed as percentage of the annual normal rainfall was just 19 in Jind district during 1927. It may also be added that 1905, 1918, 1929, 1938, 1939 were the years of wide spread drought when as many as 11 districts out of the total 12 were experiencing rainfall less than 75 per cent of the annual normal rainfall. In the year 1918, almost whole of the state was affected by drought condition. The same situation we are facing during the currect year. Moreover, the intensity of drought in the current year in more in comparison to that of the year 1918.

During the period between 1901 and 1987 there was no drought in the state only in 35 years namely 1906, 1909, 1910, 1914, 1916, 1917, 1923, 1925, 1931, 1933, 1942, 1945, 1947, 1955, 1956, 1957, 1958, 1960, 1961, 1964, 1966, 1967, 1970, 1971, 1973, 1975, 1976, 1977, 1978, 1980, 1981, 1983, 1984, 1985 and 1986. In the 15 years namely 1908, 1912, 1913, 1919, 1922, 1924, 1926, 1930, 1934, 1935, 1948, 1949, 1953, 1954 and 1979 either of the districts of the state experienced the drought condition. It is interesting to observe that since 1901 till date, Ambala is the only district of the state which has fallen in the grip of drought in two consecutive years only once.

The above statistical analysis reveals that whole of the state is more or less drought prone in the meteorological sense. We should, therefore, tackle this problem of Haryana with a fool-proof strategy.

Faced with the emerging drought situation, the government has initiated a number of steps. They include assured supply of electricity to farmers, releases of water for irrigation, increasing the inventory of seeds and so on. Arrangements for the supply of drinking water and fodder aimed at the meeting basic needs of the human and cattle population are also being given priority

The decline in food availability is, only one aspect of the drought. The other is the damage that it inflicts on millions of poor households who depend on the rural economy for their livelihood and earnings. The poorest among them include small and marginal farmers, landless agricultural labourers, craftsmen and other non-agricultural workers and casual workers of different sorts. The drought has robbed them of incomes that normallyderive from their assets such as land and cattle or from their labour power which is the only source of earning available to assetless rural workers. Agricultural labourersare likely to be the worst affected. It is feared that they may suffer a sharp decline in their earnings because of loosen employment and depressed wages. This, alongwith an increase in foodgrains prices, will have a disastrous effect on their real incomes. Altogether the exchange relationship between earnings on the one hand and incomes needed to meet subsistence requirements on the other, will get sharply worsened for all categories of the rural people. Foodgrains may be physically available but not the wherewithal to pay for them as far as the poor are concerned. To face these eventualities, Haryana Government has intensified two principal employment programmes viz. NREP (National Rural Employment Programme) and RLEGP (Rural Landless Employment Guarantee Programme). The minimum wages for the skilled and unskilled labourers in the state have been substantially raised and they are the highest in Haryana as compared to other states.

Prof. Amartya Sen, in his illuminating study of 'Poverty and Famines' has shown that famines are not necessarily related to a decline in food availability at the country level. Bythe same token, famines or drought cannot be averted by safeguarding or supplementing food availability alone. Alongwith it, state intervention will be necessary to transfer incomes to those who have lost their normal entitlements and tomake food available at prices at which income-transfers will be adequate for subsistance.

The more serious problem, therefore, is to provide the purchasing power. We may also quote from the Famine Enquiry Commission of 1880 (pp. 204-5) in this regard "Distress is mainly among the agricultural portion of the population thrown out of work by failure of their ordinary employment and the few small trades and handicrafts which are chiefly depend upon them for sale of their manufactures". More than 2,000 years ago, Kautilya advised his King Chandragupta that "During famines he should institute the building of forts or water works with the grant of food or share (his) provisions (with them) or entrust the country (to another kind)". It is through public works programmes that famines and droughts were managed in the past. The management became easier after the 'Famine Codes' were introducted around 1883. Present drought management is carried through this code in the state. Though these measures are necessary yet not sufficient in the present day economy. Recurring droughts have shattred the state economy. Alone this year, crops worth Rs. 750 crore have been destroyeyed. More than 40 lakh heads of livestock have been affected. Wells and ponds have gone dry. Fodder has become scarce. The State Government, despite heavy constraints on it financial

resources, have taken certain solid steps to face the drought and to boost the purchasing power of the people. Ponds and tanks have been filled with water. Fodder has been arranged for the cattle. The government is paying the fare charges on the fodder imported from other states Short term loans have been converted into middle term ones. Recovery of taccavi and abiana has also been postponed in the drought affected areas. A subsidy of 25 per cent on seeds is to be given to the farmers for Rabi crops. The State Government has also approached the Central Government for grant of subsidy on fertilizers. The Central Government has been requested for an assistance of Rs. 471 crore to tackle the menace of drought. Despite various handicaps, the State Government has tried its best to make the best of a fast deteriorating situation.

Above these measures, however, are adhoc, Haryana needs to evolve a long term plan to tackle the drought calamity. In this regard, the Central Government has been approached for speedy construction of S.Y.L. canal through its own agencies. This will create bigger surface irrigation potential and a sizeable section of surface water will settle down to maintain the ground water table at a feasible level. Additional energisation of tubewells would help to bring sufficient parched land of the state under irrigation. With these measures, we would be able to arrest the recurring drought conditions of the State on a permanent basis.

The spectre of current drought is looming large over Haryana. Haryanvis though have enough potential and patience to bear such economic shocks, yet for this unprecedented drought of the century, they need immediate relief and dose for quick revival of the state economy. Drought proofing is an engineering and political challenge, let us face it with update skill and power.

—Haryana Review, Public Relations Department Haryana. December, 1987.

HARYANA'S MILK POTENTIALITY

By S.B. Dahiya

The popular proverb 'Deson Main Des Haryana Jitt Dudh Dahi Ka Khana' most aptly describes the plentitude of milk and the dietary habits of the people of this region. While milk is plentiful, its consumption by local people is also the highest. On the basis of available statistics Haryana, which forms just 1.3% of the country's total geographical area possesses about 2.79% of India's cattle and buffaloes and is contributing 6.5% to the milk pail of the country. Haryana has the highest daily per capita availability of milk (which is little over 500 grams) in the country as compared to all India average of 110 grams and makes over 10 lakh metric tonnes milk annually as marketable surplus. Haryana, therefore, can very well be said to be the Finland of India.

Cattle and buffaloes have been our main source of milk. The age old noble tradition of cattle breeding is indeed something unique and it inspires one and all with a charm of livestock breeding. And Haryana is renowned for its Murrah buffaloes and Haryana cows not only in the state but in the entire country. The state has also been exporting quality Murrah buffaloes to other countries.

According to livestock census of 1972 there are 24.5 lakh cattle and 25.2 lakh buffaloes in the state. The concentration of a large number of cattle/buffaloes is no index to the production of milk or economic prosperity of the state. The average milk yield of Haryana cow is 550 Kgs and that of Buffalo 1300 Kgs per lactation. This is fairly higher

than the all India average of 173 Kgs in cows and 491 Kgs in buffaloes but it is miserably low compared to milk yield of 3700 Kgs in some of the advanced countries.

In order to achieve the objective of white revolution various programmes have been launched for upgrading local cattle in the shortest possible period for maximum production. Cross breeding indigenous cows with the more potential exotic bulls and selective breeding in buffaloes with proven Murrah bulls have been encouraged for augmenting milk production.

Importance of the Programme

On the basis of 1966-67 survey results it was found that daily average milk yield per cow was 2.350 kgs and that of buffalo was 4.350 kgs while the per capita per day availability of milk was 352 grams.

There is an appreciable increase in milk production of cross-bred cows as compared with the indigenous dams. The sample study of 1972-73 revealed that the average daily milk yield per cow in the state has increased to 3.053 kgs giving an increase of 0.703 kgs per cow per day. Similarly in buffalo the daily yield has gone to 5.218 Kgs. Thus there has been 29.8% increase in the average daily milk yield of cows and 19.8% in buffalo during the period of seven years. The total milk production in the state has gone up from 10.89 lakh metric tonnes in 1966-67 to 15.59 lakh metric tonnes in 1972-73, giving an annual growth of 7.1%. The per capita per day availability of milk is 427 grams now.

After formation of Haryana the milk production could be increased from 10.89 lakh metric tonnes to 22.74 lakh metric tonnes today. In this projection the contribution of cow milk is 4.68 lakh metric tonnes and that of buffalo milk is 18.06 lakh metric tonnes. With the limited breed improved programme going on in the state the milk production of buffaloes and cows would be 22.86 lakh metric tonnes and 5.38 lach metric tonnes respectively during the year 1986-87. However, with the total involvement of cow and buffalo population under the breed improvement programme (which is 31% of the total at present) the milk production would be enchanced to 34.96 lakh metric tonnes in case of buffaloes and 16.39 lakh metric tonnes in case of cows. It would more than three times for cows milk one ahd half times more in case of buffalo milk if comparison is made between limited breed improvement-programme and total bovine improvement programme for the year 1986-87.

Hence total involvement of breedable population under breed improvement programme Haryana may provide sufficient milk to meet out the total requirement of nation on nutritional standard.

—Haryana Review, Public Relations Department Haryana. November, 1980

DAIRYING IN HARYANA -INCOME & EMPLOYMENT

By S.B. Dahiya

Dairying is an ancient cottage industry of Haryana. We have alluring references to cow-herds in our mythology. The cow has always been associated with prosperity. 'Kamadhenu' is one of the mythological characters depicting eternal prosperity and

plenty. Milk has won recognition from all societies and civilizations as a basic source of wealth and welfare.

In pastoral society milch cattle was easy to maintain and perhaps the milk yield was also plentiful. But the droughts and famines were the recurring phenomena in the state until recently that bedevilled our economy and more particularly dairying. Even then the Haryana struggled to keep its superiority in this field and is now trying to use dairying as an instrument for change. The chief occupation of its ruralite population is agriculture combined with dairying. A large majority of milk producers in the state belong to the categories of small and mariginal farmers and the landless labourers. A little more than half of the milch stock are owned by these categories of producers.

Endeavours have been continuing ever since the inception of Haryana to exploit the large milk potential that exists in the state. The state income in dominated by agriculture and its allied sectors which contributes more than 50% of the state domestic product. The contribution of milk and milk products in the state income has gone up from 6.5% in 1969-70 to 7.5% in 1976-77.

According to preliminary estimates the contribution of milk and milk products to state income in 1980-81 has further gone up around nine percent. And Harynan has immense potential for dairy development which can give employment to the rural poor at their door step. We must avail of every opportunity for husbanding our resources properly and ensure improvement of local stock. Uprgading of our ineffective milch cattle coupled with market opportunities for the milk produced in rural areas can indeed usher in an era of prosperity in rural areas. Our accent is on the weaker sections and the dairy programmes ideally lend help to the weaker sections. With the various aid agencies like SFDA MFAL, DPAP, etc. coming forward to support the dairy programmes in a bigway in our state. One can confidently say that Haryana is emerging as a premier dairy state in the country. And now to the "Operation flood-II" would give a tremendous boost to our dairy programme and let us hope that the poor people will soon realise the benefits. Small and marginal farmers predominate numerically the farming population to the state (out of 9,98,704 land holdings in the State 6,18,558 holdings are below 3 hectares as per 1976-77 agricultural census) but they stand at a clear disad vantage in terms of cultivated area and means of production. Under the existing system of farming this section of farming community continues to be in a vicious circle of poverty. In such case dairying has proved a profitable venture which gives a constant and regular flow of income from milk production all round the year.

At Haryana Agricultural University, Hisar specialized dairy farming, mixed farming and arable farming were compared. Two hectares area was put under each system of farming. The entire area under specialized dairy farming system was put under feed and fodder crops to support eight Murrah buffaloes with their followers. In mixed farming, about 50 percent area was put under fodder crops to feed four Murrah buffalo and their followers. The remaining 50 percent area was put under cereal and cash crops. In arable farming only one Murrah buffalo was kept as dairy animal and about 10 percent area was reserved for fodder cultivation. The remaining area was put under cereal and cash crops. The average net income obtained with different system of farming is given below :—

System of Farming	Gross Income (Rs.)		
	Milk	Crops	Total

1.	Specialised dairy	14085.31	3095.34	17180.65
2.	Mixed farming	4561.39	6755.12	11316.51
3.	Arable farming	1468.45	6918.37	8386.82

Expenditure	Net Income (Rs.)	
	Total	Per acre
1. 12486.84	4694.17	2347.08
2. 8625.57	2690.94	1345.47
3. 5889.12	2497.70	1248.85

The results have shown that if high yielding buffaloes are kept as dairy animals the specialized dairy farming is more remunerative than mixed farming and arable farming. The returns would have been still higher if cross bred cows were used as dairy animals as they are higher yielders.

With the already available infarstructure well organised dairy sector can absorb to a great extent unemployed or under employed human force of the state for economic prosperity. A scheme of Mini Dairy has already been launched by Dairy Development Department, Haryana for providing gainful employment to unemployed youth, ex-servicemen and Scheduledcastes with attractive incentives. About 3500 persons have already availed of this opportunity in the state.

— Haryana Review, Public Relations Department Haryana; July, 1982.

PLIGHT OF RURAL POOR

By Suraj Bhan Dahiya

History is not events, but people and all that has been lived, thought and acted upon. The 19th and early 20th century historians who were used to the "Age of Empire", have ignored the history of the masses, emerging from below. History from below is an effort to involve the people and to humanise history, it is necessary to understand the social history and to point out the painful contrast that existed be tween the splendour of the court and the squalor and poverty of the dweller in the hut.

India has 77 per cent of its population residing in 5.76 lakh villages. Most of the villagers subsist on agricultural produce. The real history of India— social, economical or political— therefore relates to these people. The report of the Indian Famine Commission, 1901, describes the living standard of the average tiller as pitifully low. Mr Wolff (Cooperation in India, 1919) remarked that in India, "it is the bonds of debt that shackle agriculture".

The total figure for agricultural debt of India was enormously high. Sir Edward Macagan calculated it to be about Rs. 300 crore in 1911. According to an enquiry made into this matter by M.L. Darling, Financial Commissioner, Revenue, (Darling, Punjab Peasant, 1928) the total debt for British India and Punjab was Rs 600 crore and Rs 90 crore respectively in 1921. The enquiry futher revealed that in Punjab the debt averaged Rs 31 per cultivated acre and Rs 76 per head of the agricultural population, and that it was at least 19 times the land revenue demand. It was claimed that Punjab was dominated by money-lenders to an extent unknown in any other province. The population of Punjab was only one-eleventh of that of the whole country but one-fourth of the money-lenders found in British India resided and worked here. In 1929, the Punjab Provincial Enquiry

Committee estimated their number at 55,000. The total amount of agricultural debt was estimated at Rs. 190 crore, entailng by way of compound interest an annual sum of Rs. 13 crore. And money lending was biggest industry of Punjab.

Above all, the land revenue system was harsh, rigid and inelastic. As the Royal Commission on Agriculture remarked:

"The Indian peasant is born in debt, lives in debt, dies in debt and bequeaths debt". The agricultural capital was supplied mostly by the village moneylenders.

With the arrival of Ch Chhotu Ram era in Punjab (1924—1945), the old order yielded place. to the new, and at the same time, visible and even spectacular changes took place. Not only was Ch Chhotu Ram a great man, he had the Midas touch, transforming the lives of the killers. His greatest contribution towards the upliftment of peasantry was the enactment of many revolutionary laws. These laws helped the farmers to be free from all debts and burdens. He captured the imagination of the country as perhaps no other man could. A logical approach to nation-building after independence should have been an allout effort on the part of the political leadership to develop rural India. This is precisely what Gandhiji had been suggesting. After independence, however, priorities were set such a way that the upper class improved its share in the national cake at the cost of agriculture and weaker section of the population. Today inter-personal income and wealth disparties have increased so sharply that India is far more of a class society than it was at the beginnig of the planning era.

Planning has brought prosperity to the top 20 per cent of the population which now claims around half of the national income and remaining 80 percent of the population practically unaffected by the growth impulses released by it. The armchair economists should understand the hard realities of the village life. Perhaps, they are living in an illusion with the achievements of the Green Revolution.

When agriculture fails to meet the basic needs of the farmers in Punjab, a state in which more than 80 per cent of the total area is under assured irrigation, the fate of those having dry and parched lands and also the rainfed lands in other parts of the country can well be imagined. Obviously, most of the farmers are living below the margin of hope. Sometime back in 1979, Dr G.S. Bhalla conducted a study which reveals that the farmers owning up to 7.5 acres of the land had a negative household savings in a year.

Other cause of growing poverty is the distribution of incremental income generated in agriculture. Nearly 58 per cent of the incremental income is passed to the rest of the economy, and this has been proved in a recent study conducted by the Tamil Nadu Agricultural University in collaboration with the International Food Policy Research Institute, Washington.

The suggests that even from the overall growth point of view of the economy, it is necessary to lay prime emphasis on agriculture and allied activities not only for its low capital out-put ratios, but also for its contribution to the rest of the economy. The so-called prosperous farmers withland holdings exceeding 25 acress saved Rs 20,100 a year which is equal to the salary of an upper division clerk.

Thus, the landless labourers or small peasant in comparision is not constricted for living space but he is consricted for every thing elese. What we are, therefore, witnessing today is a form of internal colonialism where the urban minority rules over the rural majority in terms of economic development.

— Indian Express, Chandigarh; July 7, 1990.

FARMERS : TREATED LIKE DIRT

By Suraj Bhan Dahiya

Punjabis and Haryanvis are the finest farmers in the country, the rate of growth of agriculture in Punjab and Haryana has been 5 to 6 per cent. Even so, the peasantry of this belt has not got from the government the attention they deserve.

Some structural development over the last four decades have put the peasantry of these states in trouble. The share of agriculture in state income here is declining over the period which is evident from the following figures :—

Percentage contribution of agriculture in state income :

(At current prices)

Year	Punjab	Haryana
1970-71	58.37	64.70
1987-88	44.20	40.70

The percentage of population living in rural areas or depending upon agriculture has fallen only marginally in these states (i.e from 76 per cent to 72 per cent in Punjab and from 82 per cent to 78 per cent in Haryana between 1971 and 1981) thus lowering the per capita income of cultivators and agricutural labourers. The life of rural masses, in these states undoubtedly, are really miserable.

According to one conservative estimate about 1/5 of the total peasants in this green-revolution pocket of the country, are on land not because they prefer to be there but because they find it difficult to be elsewhere. In fact, agriculture to them has been and become a deficit economy and they labour for subsistence. The outcome of a study relating to Haryana supports this argument. At 1984-85 prices the per capita monthly expenditure at the poverty line has been estimated to be Rs 107 in rural areas. The average size of the household in Haryana is reckoned at 7 out of which 4 form the working force. Gross value of agricultural output per capita (rural) at current prices in 1987-88 was Rs 2205 in Haryana. Thus a rural household's annual in come comes out to be Rs 8820. The annual consumption expenditure of such household is estimated at Rs 8988 (107 x 7 x 12 = 8988)

Thus even for the minimum consumtion for keeping the body and soul together a rural household requires an income of Rs 8988 per year and this does not include other necessities of life such as medical care, education etc. This is the crux of the problem.

A study jointly undertaken by Indian Council of Social Science Research and the Punjab State Planning Board has revealed that because of inadequate income, about one-third of the marginal farmers and about one fourth of the small farmers in Punjab are living below the poverty line.

An analysis of operational holdings reveals that as per 1980-81 Agri-cultural Census, nearly 51.38 per cent of total holdings in Haryana and 38.62 per cent of the holdings in Punjab fall within 2 hectares. These small and marginal landholders numbering 9,27,290 have a total number of about 60,17 lakh people. Tothese we could add the band of 2.26 lakh houeholds of agricultural workers numbering nearly 16.82 lakh.

Thus these small and marginal farmers together with agricultural labourers totally numbering about 76.99 lakh can be considered as hard-core rural poor in Punjab and Haryana.

About 69 to 70 per cent of the total cropped area in the so-called green revolution belt is under food crops hence it is a food-based system. But agricultural prices, especially of foodgrains, are depressed — not by market forces — but by price control and other measures. It is this dichotomy which has proved harmful to the major foodgrains' producing states.

The relative price deifference between inputs and outputs has gone against the peasants of Punjab and Haryana for over two decades. They now have a confrontationist attitude toward the selfish urban elites.

There are in all about 33.04 lakh youth in the age group of 15-19 years. The numerical dominance of rural youth is a matter of concern to us. They constitute over three times the urban youth in the two states. De-spite their out-numbering the urban youth, the opportunities available to young rural men and women are qualitatively and quantitatively different.

Rapid urbanisation has been witnessed in Haryana after 1966. And this has led to the vast employment opening in secondary and tertiary sectors of the economy and shifting of population for gainful employment as is evident fron the following data :—

Inter-state, in out and net birth place migrants

	1971	(in hundred)	
	In	Out	Net
Punjab	5848	11660	-5812
Huryana	8576	8311	265
	1981		
	In	Out	Net
Punjab	8811	12858	-4047
Haryana	11824	11478	346

Mass inmigration has been noticed in Haryana in the last two decades. The huge influx has deprived many Haryanvis of job prospects though urban growth is the outcome of their sweat.

Comparatively, Punjab's urban growth has remained low. However, the above figures relating to Punjab show a trend in favour of out migration mainly to the Union Territory of Chandigarh and to its vicinity. In fact, so far development priorities have been defined in favour of urban people, leaving rural masses uncared for.

Faulty and inadequate base level rural education has resulted in crippling rural youth. The malaise that afflicts education in the states can be gauged if the following literacy rates are studied :

Percentage literacy rate in 1981

	Urban	Rural
Punjab	57	35

The urban-rural disparities in terms of literacy rates are due to the fact that only urban youth have access to real educational facilities and hence information about career opportunities. Under-privileged rural youth remain completely directionless. The present thinking is to develop rural areas with more resources but it remains to be seen as the whether this will benefit the rural youth or he will continue to remain mentally under-nourished.

"Credit" says an old French proverb, "supports the farmer as the hangman's rope supports the hanged. "But the supply of the rural credit - the most potent instrument for agricultural development has been meagre in spite of appreciable increase in the agricultural production in the two states. Reason is that 58 per cent of the incremental income generated in agriculture is passed on to the rest of the economy, and this has proved in a recent study conducted by the Tamil Nadu Agricultutal University in collaboration with the International Food Policy Research Institute, Washington.

It is a matter of grat concern that even after higher deposit mobilisations, credit performance of commercial banks in Punjab and Haryana has been unfavourable This can be infered from these figures :—

Credit-deposit ratio of Commercial banks

Year		Punjab	Haryana
March 1989		43.42	63.21
March 1988		42.80	65.18
	Maharashtra	**Karnataka**	**Tamil Nadu**
March 1989	77.53	97.05	101.17
March 1988	76.43	93.15	99.39

In sum, Punjab and Haryana have been exploited in the name of agricultural prosperity and are being ignored in terms of socio-economic upliftment.

— The Tribune, Chandigarh. July 19, 1990.

PERSPECTIVE ON IRRIGATION IN HARYANA

By Suraj Bhan Dahiya

Haryana is the country's second biggest producer of surplus food after Punjab. What has already been achieved in the state is not enough. The need for higher production is immediate and enduring.

In Haryana, the potential of drylands, which are in abundance, can be further exploited with perennial irrigation. Great stretches of fertile areas within the command of the existing irrigation boundaries of the canal system still remain without water. Of late, certain imbalances in irrigation facilities have been a major concern of the people of various areas of the state. The percentage of the gross area irrigated to the total cropped area is the lowest in Mahendragarh district, being 29.3 per cent as against the average of 71.6 per cent for the state as per 1990-91 statistics. In order to meet the staggering

demand for agricultural water in Haryana, it is essential to utilise and harness, to the maximum extent possible, the available surface water before attempting to lift ground water.

Surface Water : Haryana gets water from the Yamuna through the Western Yamuna Canal system and from the Sutlej through the Bhakra Canal system. The volume of water in the rivers is subject to extreme variation. The seasonal regimes of the Sutlej and the Yamuna are of great significance as they pour 80 to 95 per cent of canal water into Haryana. The difference between the maximum and the minimum discharges of two rivers are remarkably high as is evident from the following table:

River	Site	Discharge in cubic feet per second	
		Minimum	Maximum
Sutlej	Ropar	2818	2,50,000
Yamuna	Tejewala	2531	5,05,860

The fluctuation in canal discharges is a limiting factor for successful farming. Haryana should normally receive between 10,500 cusecs and 11,000 cusecs of water daily from the Bhakra Canal system. The maximum supply it receives during the summer season (April to September) is only 9,400 cusecs a day during a normal year. This also includes Delhi's and Rajasthan's share.

Haryana's share from the Yamuna varies between 3,000 cusecs and 4,000 cusecs. This is so little that it cannot feed even one out of the five groups of the Western Yamuna Canal. This availability has to be often supplemented from tubewells. The supplyin the Western Yamuna Canal system sometimes even goes down to even 1,000 cusecs. While the Bhakra Canal system mainly feeds Sirsa. Hisar, Kurukshetra and Kaithal districts and parts of Karnal and Jind districts, the Western Yamuna Canal feeds Panipat, Karnal, Sonipat and Rohtak districts and parts of Hisar, Bhiwani and Kurukshetra districts. Some fringe areas of Faridabad and Gurgaon districts get water through the Agra Canal of the Eastern Yamuna Canal.

The Bhakra Canal system mostly flows for 21 days in month and the five-group-system of the Western Yamuna Canal gets an eight day supply by rotation in a 40 day circle, i.e. each group is subjected to 32 days' closure. This arrangement appears far from satisfactory.

Ground Water: The contribution of ground water to the total water supply of the state is the greatest in he fresh water zone. There are large areas of irrigated land in Haryana which are entirely dependent on ground water. Fresh ground water areas comprise mainly the Northern part of the state, comprising Ambala, Yamunangar and Kurukshetra districts, and also parts of Kaithal and Karnal districts. The fresh water zone extends along the Yamuna and the Ghaggar and along the Hansi Branch of the Western Yamuna Canal. Fresh-water pockets are also found on the Aravalli hills and along the Bhakra Canal system of Sirsa and Hisar districts.

The saline ground water (unfit for irrigation) area comprises the central, Southern and Western districts and covers nearly two-third of the state.

Tubewells have been successful primarily in the North-East of the sub-alluvial ridge, particularly in the Southern part of Jagadhri tahsil, the extreme South-East of Ambala tahsil, the whole of Thanesar, Gulha, Karnal and Panipat tahsils, central Jind, Northern Safidon, Eastern Sonipat, Ganaur and Fatehabad tahsils and scattered patches in the South of the state where the intensity of tubewell irrigation varies from 30 per cent to over 90 per cent. Out of about 26 lakh hectares of the net irrigated area in the state in 1990-91, 12.63 lakh hectares of land is irrigated by tubewells and 13.37 lakh hectares by canals. The net irrigated area froms 72.7 per cent of the total area sown.

Half of Haryana is now virtually floating over sub-soil water, a mere three metres below the cultivable crust. Experts are of the view that if the threar posed by the watertable is not checked effectively in the near future, Haryana, a veritable grain bowl, may turn arid and infertile.

The latest survey results show that during the past decade the water level in the sweet belt has declined by 1.31 metres to 7.47 metres. With the number of "minor-irrigation structures" crossing the figure of 5.11 lakh as against only 27,000 in 1967, the over-exploitation of ground water in the sweet-water zones continues unabated. The latest assessment of ground water resources reveals that the total quantity of ground water available in Haryana is 8.423 million cubic metres (mcm). Of this, the present utilisation is around 7.248 mcm.

Over-exploitation of ground water has taken place in the districts of Karnal, Panipat, Kurukshetra, Kaithal and parts of Ambala, Yamunanagar, Gurgaon and Jind disticts. These areas now witness a constant decline in the water table. The exploitation of ground water in these areas is as high as 365 per cent against the state average of 78 per cent and the all India average of 42 per cent. Haryana may become a vast wasteland in the coming decades if the present trend of over-exploitation of its ground water-resources is not checked.

Thus all the available surface and ground water resources add upto a total of 1.85 million hectare metres (mhm). The surface water potential is 1.05 mhm and ground water 0.80 ham against an estimated requirement of 4.13 mhm. Haryana hopes for another 0.47 ham (3.82 mhm) of water from surplus Ravi-Beas waters. All this meets about 56 per cent of Haryana's requirement of water, leaving a gap of 1.81 mhm.

Intensity of Irrrigation : The intensity of irrigation is crucial in determining the intensity of cropping, the cropping pattern and agri-cultural production. The intensity of irrigation from all sources varies markedly in different parts of the state. In this regard, the following data for the year 1990-91 need thorough examination.

District	Gross area irrigated (000 hects)	Percentage to state total	Irrigation intensity
1	2	3	4

Ambala	153	3.61	184.34
Yamunanagar	144	3.40	158.24
Kurukshetra	247	5.83	184.33
Kaithal	364	8.59	171.70
Karnal	288	6.80	188.24
Panipat	240	5.66	158.94
Sonipat	152	3.59	144.76
Rohtak	363	8.57	140.15
Faridabad	175	4.13	221.52
Gurgaon	139	3.28	147.87
Rewari	94	2.22	101.07
Mahendragarh	77	1.82	104.05
Bhiwani	217	5.12	137.34
Jind	352	8.31	171.71
Hisar	774	18.26	174.72
Sirsa	452	10.81	172.18
State	4237	100.00	162.96

A conspicuous fact in the spatial variation in the intensity of irrigation is that considerably high (over 170 per cent) percentages are met in Ambala, Kurukshetra, Kaithal Karnal, Faridabad, Jind, Hisar and Sirsa districts. These are the old canal irrigated as well as the new canal and tubewell-irrigated areas which are covered by alluvial soils. The low (between 150% and 170%) and very low (under 150%) proportions are in the North-East, South and South-West of Haryana because of restricted usable flow, limited or salt-ridden subsoil water and hilly or undulating topography covered with infertile and a thin soil cover.

Such low intensity irrigation has kept farming in a precarious unstable condition even at a subsistence level. For the sake of socio-economic stability and equality in the state, these "weaker areas" need to be given priority and special attention in matters of irrigation facilities.

The distribution map recording the intensity of irrigation shows a marked variation in irrigation facilities. The intensity of irrigation in the area fed by the Bhakra system is 93 per cent as against the planned in tensity of 63 per cent when the Bhakra Dam was built. The intensity of irigation of the area fed by the Western Yamuna Canal is 67 per cent. It is alleged that a major share of the Bhakra water flows through Sirsa, Hisar and Jind districts, denying an equitable share of water to the central and Southern-most districts..

Water-Logging : Economy in the use of water for irrigation purposes is an important consideration of the state. Excessive use of irrigation water in certain areas has

posed a serious threat. In the area irrigated by the Bhakra Canal system, the water table has risen alarmingly, i.e. over 20 feet, and there are pockets where it has risen over 40 feet. These are mostly found in Kaithal, Narwana Hisar, Fatehabad, Dabwali tahsils and a major part of Sirsa tahsil. The rise in the watertable since 1955 is continuous in all areas commanded by the Bhakra Canal system.

Half of Haryana is now virtually floating over sub-soil water, a mere three metres below the cultivable crust. Experts are of the view that if the threat posed by the watertable is not checked effectively in the near future, Haryana, a veritable grain bowl, may urn arid and infertile. The threat appears more serious when we observe that 4,000 sq km, i.e. almost one-tenth of the state's area, is affected by salinity and the rising watertable. In a few places in Sirsa and Hisar districts, the watertable has come up to almost three metres of the fertile crust. Excessive irrigation may thus turn the "cotton tract" into marshy land.

Conclusion : The physical resources of Haryana are adequate enough to at least double the current agricultural production of one crore tonnes if full use is made of modern tecnology and intensive irrigation. It would, under the circumstances, be proper not to except much of an increase in the area under irrigation, unless of course Haryana's share from the Ravi-Beas waters is made accesible.

The main points to be emphasised are that the state government should endeavour to arrive at an agreement with the Punjab Government on the sharing of waters from the Bhakra and Beas complexes.

Meanwhile, a judicious decision would need to be taken regarding the distribution of water for increasing the intensity of irrigation inthe existing areas and for extending irrigation in the weak areas. Here, while increasing the intensity of irrigation, care has to be taken not to add to water-logging in those areas. In extending irrigation, consideration should be given to those areas that are drought-affected, particularly those areas where tubewell irrigation is not feasible or where the ground water is brackish and not suitable for irrigation purposes. The principle of equality seems to be ignored in the distribution of canal water in Haryana.

Haryana, therefore, needs a uniform irrigation cover so as to provide "drought insurance" to large areas in the South and South-West and to control and rahabilitate water-logged and saline areas in the central and North-Western parts of the state.

— The Tribune, Chandigarh; June 10, 1993

NATURE'S BOUNTY TO HARYANA

By Suraj Bhan Dahiya

Right on the periphery of Panchkula lie "the Morni Hills". Though hardly 4000 feet above sea level, the Morni Hills have all the trappings of a hill resort, complete with

a lush green landscape, swaying trees and a mountain backdrop - a quaint little resort with no frills but all comforts.

The area is sleeped in history and mythology. Legend of the Morni Hills go back to the times of the Pandavas. During the fag end of the years of their exile, the Pandavas ventured into the green hills of Morni. The Kauravas who were ever in search for them, gained word of their presence here. They came up the hill sides eager to track down their cousins. To hide themselves, Bhima and Arjuna used their magical power to create a mirage by raising goddesses on the hill-sides, behind whom they hid from the enemy. Till to date, this natural beauty has not been exploited by the massflow.

Traditions also assign the name of Morni to a queen who is believed to have ruled this area. Ruins of an old fort here make for a pheasant reserve. The Morni Hills area falls under the Morni Development Block. According to the 1991 census the total population of the block is 16,487 persons. The block comprises 15 villages, out of which 14 are prefixed with Bhoj, viz, Bhoj Palasra (1594), Bhoj Dharti (923), Bhoj Naita (468), Bhoj Tipra (749), Bhoj Darara (253), Bhoj Koti (1049), Bhoj Kothi (403), Bhoj Nagal (2629), Bhoj Jabial (1069), Bhoj Raipura (1896), Bhoj Kudana (1093), Bhoj Balig (437), Bhoj Ponta (976). The figures in the brackets indicate the population.

A state road leads to this small hill top retreat. This is a splendid green glade dotted with random clusters of flowering trees. Cutting a deep valley within the hills the river Ghaggar flows with the musical notes. The hamlets in the hills are serene and quiet — an image of pastoral pleasures.

The hills look green and violet. In their midst hide varied attractions. Two large water bodies of "tals" prove an ideal trek destination. The large "tal" is about 550 metres long and 460 metres broad and the other about 365 metres either way. A hill divides the two lakes but there is some hidden communication as the level of the two lakes remains the same throughout. The water of these lakes is also channelised to fields for irrigation in far off villages. The people look upon the lakes as sacred and wend their way to their banks on ceremonial occasions.

Adding a touch of ancient history to the site lies a small temple. Though the structure is new the Trimurti inside dates to the 12th century A.D. when a Shiva temple once stood here. A trek tothe two "talls" is a delight. For the more adventure conscious, a trek to the Ghaggar river banks can also be made.

The Morni Hills abound in fascinating flora and fauna. The low hill tracks of Morni abound in "neem" "oak", "peepal", "jamun", dhak" "amaltas", "jacaranda" trees. As a results, the brown and green of the hills are tinged with splashes of colour each time the trees flower. The pine or "chill", as the locals call it, crowns the hill top and is one of the most delightful sights of the Morni Hills.

The birds that nest in the hilly and scrub cover of Morni Hills are the common doves, quails and sandgrouse. The hills also have a select range of wildlife — the sambhar, jackals and hyena roam the wilds of the hills.

Increase in population in the region, however has enhanced the demand for timber, fuel, cultivable area and settlement area. To meet these ever increasing demands many forested pockets have been cleared unscientifically, De-forestation has ultimately brought about numberous hardships and even ruin in the Morni Hills tract.

Forest cover has drastically thinned down in recent years. Conservation of what is left is the crying need of the hour. The Forest Department is trying its best in making the felling of trees as difficult as possible, There is a law against felling even privately owned forests. But selective feeling of old trees has to be permitted so that young ones will have enough space and light. Besides genuine personal needs have to be met. The Forest Department should identify the old trees and the farmers should be allowed to sell these trees. It is being felt that farmers are generally harassed to get permit for felling their old trees. In contrast, the forest guard hardly checks the contractor for feeling even a green tree.

The Forest Department must encourage farmers to grow more and more pine trees and train them in the art and science of growing this valuable plant.

Recognising the tourism potential of the area and the possibility of adventure sport, the Haryana Tourism Corporation has marked the Morni Hills for trekking, rock climbing and camping. Possibilities for hang gliding in the area are being explored. To give further impetus, the government has constituted the Morni Hills Development Board.

The area is still unspolit as is evident from the little traffic on the road from Chandigarh. Larger exposure will certainly rob the latent beauty of Morni Hills and in the name of development, it is feared that Morni will shed away its naturaj glamour.

A few who do go there fall in love with the place and often return, thanking that mass tourism has not yet caught on here.

— The Tribune, Chandigarh; January 5, 1994

THE PLIGHT OF SMALL FARMERS

By Suraj Bhan Dahiya

Every politician, economist or for that matter every journalist dealing with farming and allied topics never forgets to remind that India is an agricultural country and the mainstay of its economy (about 30 per cent of the national income) is agriculture.

With regard to agriculture, mainly two issues have been under discussion. One: India's farmers, farm scientists and policy makers have pushed up the foodgrains production from a mere 50.82 millin tonnes in 1950-51 to an estimated 198 million tonnes today. Two, it is a matter of anxiety. For, with the population of the country touching the 100-crore mark by the end of this century, the question that haunts one is: will India be able to produce sufficient foodgrains in order to ensure that no Indian goes to bed hungry by than?

On foodgrains production we talk about the green revolution, though it appears to have stagnated since the mid-eighties and surely it is a cause for worry, And the farmers of the green revolution belt — Punjab, Hayana and Western Uttar Pradesh — are bracketed as prospercus. But it is a myth.

There are about 10.5 crore agriculturist fam ilies in India now and the majority of them— over 65 percent — are small and the marginal farmers. Since the sixties — after witnessing the green revolution — some economists, have pointlessly been discussing the so-called agricultural prosperity. If rural India has emerged as an island of prosperity, why do more than 40 per cent of the rural people still live below the poverty line as per official statistics? Real poverty, however, has a large magnitude.

If agriculture has become a prosperous occupation why then the linkage effects did not take place? One doubts the validity of the arguments of these experts? Did the benefits of technological breakthrough reach rural India to the extent necessary for freeing them from the poverty trap or did the benefits reach other sectors through the articulated price system? The possible answer could be "yes". The benefits of the green revolution have only been passed on to the well-organised consumers. To the Indian farmer, agriculture is only his way of life and not a commercial proposition.

It would be interesting to cite the outcome of a study jointly undertaken by the Indian Council of Social Science Reserch (ICSSR) and the Punjab State Planning Board which has revealed that because of their inadequate incomes, about one-third of the marginal farmers and about one-fourth of the small farmers in Punjab are living below the poverty line.

When agriculture fails to meet the basic needs of the farmers in Punjab, a state in which more than 80 per cent of the total area is under assured irrigation, the fate fo those having dry and parched lands and also rainfed lands in other parts of the country can be well imagined. Obviously most of the farmers in India are living below the margin of hope.

Let us review the size of the economic land holding, it is that which must afford a reasoable standard of living to the cultivator and privide employment to a family of normal size. If one looks at the results of a study conducted by Dr G.S. Bhalla in 1979 one finds that the farmers owning up to 7.5 acres of land had a negative household saving. What will be the size of the economic holding is a very difficult question, therefore, to answer.

Now to be honest, our concern should be centred on how the vicious circle of poverty of small farmers could be broken? India has an annual growth potential in agricultural trade to the extent of 25-30 per cent in view of its rich and diverse agro-climate conducive to growing a large veriety of crops, the availability of ample sunlight and low labour costs.

The small farmers must be involved in agricultural and processed food products export business at the village level. Small-scale food industries should be set up by these farmers. Like the ICICI Bank the Small Farmers' Credit & Investment Corporation (SFCIC) should be established and Japan-type farming should be introduced in India. In Japan, no family is tied to land on a whole-time basis. Keeping in view the global screnario, the small farmers to meet our food demands, but at the same time the enrichment of life of these farmers should also be encouraged to continue in the farming to meet our food demands, but at the same time the enrichment of life of these farmers should also be ensured. In fact, to revolutionise the agricultural trade a consortium of Punjab Haryana and Himachal Pradesh is the need of the hour.

— The Tribune, Chandigarh. January 15, 1998.

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KISAN CREDIT CARD A RIGHT APPROACH

By Suraj Bhan Dahiya

No other public problem has been more widely discussed in India than agricultural indebtedness throughout the 20th century. The peasantry has already staggerd into a ruinous economic situation. It is visible that the balance of economic power is now shifting and creating social tension in the Indian society.

According to Famine Commissions of 1880 and 1901, at least four-fifths of the cultivations were in debt and were fast losing possession of their lands. The Government of India, therefore, initiated some measures to tackle the problem by passing the Punjab Land Alienation Act, 1901. But the laws were too complicated for the unsophisticated peasants to understand and they gave a decisive advantage to the money lenders. The Act could hardly ameliorate the lot of the Punjab peassant.

Paradoxically, Punjab, in spite of its comparatively good conditions, was the heavily indebted province of British India. Malcom Darling in his authoritative book "The Punjab Peasant in Prosperity and Debt" estimated the debt burden of Rs 90 crore in

1921 engulfing 80 per cent of the state peasantry. Indebtedness has reached too high a pitch and the peasantry continued groaning under its weight. This irked the Royal Commission on Agriculture, 1928, to remark: "No one, we trust, desires to witness the continuation of a system, under which people are born in debt, live in debt and die in debt, passing their burden to those who follow".

The Government of India addressed the debt burden problem to the Indian Central Banking Enquiry Committee which in 1934 put the figure of total rural indebtedness of India at Rs. 900 crore. In the post-independence period Thirumalai estimated the rural indebtedness at Rs 1,800 crore.

At present, the loans of farmers from government agencies in the country stand, at Rs 19,000 crore. The out standing loans from money lenders are the multiple of the above estimate and it is agreed upon that the total debt burden on peasantry is equivalent to the total black money circulation in India — very grave situation indeed!

"Credit", says an old French proverb, " supports the farmers as the hangman's rope supports the hanged." But if credit is sometimes small it is often indipensable to the cultivator. That the cultivator cannot carry on his business without outside finance is a fact proved by history and evidenced by the appalling indebtedness of the persons engaged in the business of agriculture. According to the findings of the Rural Credit Survey Committee, the amount of debt owned to money lenders was 44.8 per cent of the total debt in 1956-57. This proportion is over 47 per cent now. And it is a matter of great anxiety since the government institutions in spite of a wide network have not measured up to expectations in disbursing credit at the retail level. I quote the findings of a recent study headed by J.N.L. Srivastava, Additional Secretary, Ministry of Agriculture, Union Government. "Farmers' indebtedness is on the rise in Haryana and Punjab as most of them are prefering money lenders over commercial banks. Suprisingly, nearly 60 per cent of the farmers in Punjab and 45 per cent in Haryana are heavily dependent on money lenders for short-term loans at exorbitant rates of interest ranging from 24 per cent to 36 per cent. The share of commercial banks in providing credit was almost negligible — in Punjab it was 4.71 per cent against 5.67 per cent in Haryana during 1996-97"

At present, nearly Rs. 5,700 crore loans are due to Punjab farmers and Rs. 3,300-3,500 crore to Haryana farmers. If this is the debt scenario in the two most agriculturally advanced states of the country the fate of farmers of other states can be well imagined.

The money lenders take full advantage of farmers' limitations. Once the peasant has taken a loan from the loan shark he is permanently in debt trap.

The fact remains that the agricultural sector has been discriminated against over the years and the fatalism that has gripped the farmers is now mainfesting itself in large scale tensions in the rural econimy. There exists a substantial gap between the demand for and supply of agricultural credit. The government is seized of the problem. Now efforts are being made to meet the credit requirements of 77 million small farmers of the country. An ambitious plan of Rs 1.49 lakh crore of NABARD is also in the offing.

Meanwhile, promising to free the farmers from the perennial indebtedness the kisan credit card (KCC) scheme has become operational. The scheme is being

implemented through commercial banks, regional rural banks and cooperative banks. The scheme will help to end exploitation by money lenders.

The farmers may get short term, revolving cash credit etc. under the scheme which attracts 8 per cent interest. The farmers are now eligible for a production credit of more than Rs 5,000.

The credit limit on the card is fixed on the basis of operational land holding, including leased land, and the cropping pattern and scales of finances as recommended by the district or state-level technical committee.

The banks too have the freedom to fix appropriate sub-limits for credit, considering the seasonality in credit requirement. The KCC is, thus, one right step forward to make the peasantry free from dept. Hopefully, the national agricultural policy, likely to be announced soon, would act to transform the peasantry into a prosperous society.

— The Tribune, Chandigarh; October 10, 1998

BURRAH BUFFALO BEST BET FOR EXPORT

By Suraj Bhan Dahiya

Numerically India possesse the largest cattle and buffalo population for any single country in the world. Paradoxically, while the number of levestock in the country is impressive, its impact is not reflected on our exports. In an agro-based economy like that of ours, animal keeping should now be transformed into a systematic industry. There are eight well-defined breeds of buffalo and 25 breeds of cow whose quality of hardiness and disease resistance are well-known throughout the world. The better breed animals comprising hardly one-fourth of the total bovine population of India, which are found mostly in the North-Western dry areas of the country. Since these these breeds have demostrted good potentialities and are capable of high milk yield, they should be competed in global trade.

It is an acknowledged fact that the buffalo is a better convertor of coarse feeds into fat-rich milk even under harsh agro-climatic situations. We have in the country the world's best dairy type buffalo-the Murrah-capable of milk yields as high as 35 Kg. a day. The buffalo of Murrah breed, which is described as "Asian tractor", is in fact triple purpose animal-for milk, meat and work.

Remember two things: Murrah is the finest genetic material of buffalo in the world and our cows are low milk yielders in comparison to the cows of the leading dairy nations. If India is to enter the world livestock trade, our best bet would be the Murrah buffalo. This breed has beaten the best dairy cows of the world in performance. We must capitalise this distinct status and launch the Murrah buffalo as an export item. Globalisation of Murrah would ensure not only better returns to farmers but would also facilitate the much-needed capital formation in the rural sector. Murrah export assumes further significance as it will contribute towards employment generation, apart from diversification of overburdened agriculture.

Besides acquiring hard foreign currency, the Murrah export is deemed necessary to sustain the tempo of the farm sector as a whole. Above all, the export of this new item will pick up at a much faster pace than that of traditional items.

Under the present package of scienticic breeding, the Murrah buffalo keeping is a commercially viable agro-based industry promising regular dividends to the individual breeder and multi-benefits to society at large.

Haryana is the home of Murrah buffalo. Here the Murrah buffalo keeping has a special role as its husbandary has been the way of life. Consequently, Haryana has the privilege of being known as the livestock mint of India. The state is now coming up as a market for producing export quality stock.

Haryana's trade in milch animals outside the state lends undoubtedly a great economic fillip to rural breeders of Murrah buffalo. But surelythis trade cannot and should not flourish at the loss of the state's invaluable treasure in genetic material that goes with the parting of the chosen best. Thisissue has assumed considerable relevance,particularly in the light of the fact that these animals, removal each year from the country's best breeding tracts to the big cities, are destined to be consigned to the slaughter house as soon as the days of their current lactation come to an end. During the sojourn in the cities, these milch animals are not bred. As such with their untimely end the nation is also deprived of the priceless progenies that could have otherwise born and perpetuated the lines.

The breed improvement programme is very expensive and a slow pocess. Millions of small owners and cattle are involved. With all complexities and constraints we have to take very harash decision to ban Murrah buffalo slaughting. In this venture, we should profit from the experience and knowledge gained in the countries more advanced in animal husbandry. A modest beginning under the "Murrah conservation programme" has been made in Haryana to save this breed.

India resorted to cross-breeding in cows in the sixties by opening intensive cattle development projects. Much emphasis was laid on cattle development, ignoring the best indigenous genetic material of the Murrah breed. Of the total production of milk of India, about 53 per cent comes from buffaloes, 43 per cent from cows and 4 per cent from goats and sheep. It will also be interesting to look into 2X2 AXIS milk pricing formula adopted by dairy plants. For cow milk, the average fat varies from 3 to 5 per cent and for buffalo mild from 7.5 to 9 per cent. Under the Prevention of Food Adulteration Rules, cow milk should have a minimum solids-non-fat content of 8.5per cent, whilst in the milk of buffalo the SNF prescribed is 9 per cent. In economic terms, therefore, the rearing of Buffalo is advantageous than cow keeping.

Considering the above facts, advanced dairy countries are studying the economics of Murrah buffaloes each yielding over 25 kg milk a day by purchasing at a cost of Rs. 2.5 lakh each from Haryana. This shows that rich countries will soon switch over to Murrah husbandry.

Another apprehension is that like basmati rice they would also go in for the patents of Murrah the material of breed of buffalo. The exotic cross-breeding in India is no more need of the day. It is desireable to use progeny tested bulls for taking up programme of Murrah breeding on a mass scale.

— The Tribune, Chandigarh; December 19, 1998

NEED TO CONCENTRATE ON HERBAL FARMING

By Suraj Bhan Dahiya

Traditional farming has now become sort of marginal enterprise in India and the farmer here takes out of the land only the bare minimum. Nobel laureate James Watsonthe father of DNA techniqueis of the opinion that there is dearth of good ideas from the country, India has to decide where it should be 25 years from now and not two years from now. "Genes are wonderful things. Let us make them work positively for us," said Watson at the recently concluded 86th Indian Science Congress at Chennai.

Instead of focusing all its attention on traditional cultivation, India should now turn to herbal wealth "the real sunrise industry of the millennium". It urgently needs to follow the enviable track of herbal farming to harvest "sanjivini booti" for its sick agriculture and unhealthy economy.

India has yet to document fully its invaluable fauna and flora. So far it has recordedover 81,000 species of fauna and 47,000 species of flora. Of the latter, about 15,000 are unique to India and many of them are used frequently by village communities for food, timber or medicinal purposes. Our flora is virtually a living gold which is crying for immediate care and protection.

Flora is not a handmaid of agriculture but an inexhaustible reserve for providing employment and income to our growing millions in the next century. The government and agricultural experts should work on vision of herbal farming to integrate the country's farm sector with global agriculture. In global scenario, we have now to get away with the dogma that India is a land of merely crore of consumers. In the next decade or so it will be the big supplier of much needed herbal genes. This vision of India-2001 should be treated with far greater seriousness and respect in our agricultural universities. A horde of greenhorn multinationals may stumble us, but we have to face such eventualities without inherent skill. In fact, they are already setting eyes on Indian herbal wealth. And this indigenous wealth has become the material of bio-piracy.

Herbal plantation is our age-old culture. The Rigveda has a striking hymn to the Goddess of Forests. The herbal culture of India gathered strength in the "tapvanas", all over the country where the sages taught and practised the herbal wonders. Through a vast sea of herbal forests has been destroyed, yet from the slopes of the Himalayas to Cape Comorin and from the dry tracts of Rajputana to the Eastern limits of the Assam hills there is still an infinite variety of herbal plants. The flora kingdom of the country is very rich in composition and value but some 43 per cent of it has not yet been extracted economically.

Herbs are usually dispersed over extensive areas making the collection prohibitive. Since no worthwhile research work has been carried out in the field so far, most of the herbs worth crore of rupees go waste annually.

India can no longer afford to neglect the green herbal gold. The circumstances demand establishment herbal banks all over the country. Unless the farming community is involved in this venture, the nation shall not stand in the global economic arena. Through agro-climatic zonal planning for scientific plantation and management of herbal resources the farmers' indigenous expertise of "jari-booti" should be supplemented with the latest knowhow to harvest a rich herbal haul.

A large varieties of herbal plants have made their entry into our trade in the recent years. But this is the beginning, the journey is too hazardous. India, one of the world's richest biodiversity hot spot is a favourite bio-quarry. Pharmaceuticals are among the most lucrative areas for the international bio-pirates. Our ayurvedic wisdom of neem, amla, haldi, jeera, adarak, amaltas, brahmi and other hundreds of traditional medicinal plants just picked off from our soil got hurriedly patented in Europe, Australia, Canada and USA in the recent times. Above all, multinational scientists and doctors are in the Indian fields and forests to learn and collect thousands of medicinal plants. Is it not a big goncern to us? Will our indigenious herbal wealth and wisdom go the basmati way? Moreover, our anxiety is that our bureaucracy and scientists are neither equipped to fight it out nor have they any contingent plants to prevent bio-piracy.

Preparing for the new millennium India has very little options. Agriculture should not play a second fiddle to industry. We must endorse that development of herbal farming and booming of industry have to go hand in hand, Herbal cultivation now should be reorganised with the deliberate object of establishing and developing of highly profitable pharmaceuticals. Modern agricultural farms all over the country should act as herbal nurseries and help the local farmers to take up herbal crops and handle the marketing of their produce without intermediaries.

— The Tribune, Chandigarh; January 30, 1999.

COARSE CEREALS NEED GOVT. SUPPORT

By Suraj Bhan Dahiya

India produces about 31 million tonnes of coarse cereals annually and the majour coarse cereals crops are maize, jowar, bajra and millets. The average production ofd these cereals have remained almost stagnant during the last many years. Sadly to note that as per Krishi Bhavan estimates the production of coarse cereals has declined by 5 per cent during 1998-99 (29.5 million tonnes) as compared to 1997-98 (31.1 million tonnes). This will greatly add to the misries of the poor as coarse cereals are largely the poor man's cake.

Maize, jowar, bajra, ragi and other small millets account for 40 per cent of the area under the kharif crops and are distributed among different rainfall categories. Barley the other significant coarse crop is sown in rabi. Very less importance is accorded to coarse cereals in Indian agriculture though food security lies in the government extending full support fot the development extending full support for the development of coarse grains.

After two deceades of the revolution in rice and wheat crops, the Nobel Laureate, Dr. Norman E. Borlaug, had desired that the next few decades would be known as the maize era i.e. coarse grain revolution. Unfortunately, it couldn't. Recollect how maize harvest avoided a serious famine situation in Bihar in 1987. To put in a straight way that coarse grains provide essential food for the million of people and they deserve full support from the government. In such efforts alone lie the essence of food security and nutrition security for the millions.

Really there is a sorry state of affairs that all efforts on the food production front have been targeted at food availability to the higher income groups in our country. There has been emphasis on wheat and rice to the detriment of coarse grains, which are not only more nutritious but are consumed by the deprived section of society. The coarse grains production was 15.38 million tonnes in 1950-51, rose to 29.2 million tonnes in 1980-81 and 32.70 million tonnes in 1990-91 and has now stagnated. The prices of these commodities have risen faster than those of the cereal prices.

We are generous in providing massive food subsidies for rice and wheat but too conservative to release similar subsidies for coarse grains. Every government claims that it really cares for the poor but truth is that the poor remains in his squalid status. We live in a country where bottom 60 per cent of the people do not have the capacity to save or borrow and where 30 per cent live in abondage of debt. The dominent emphasis, therefore, suggests misplaced priorities.

Almost 65 to 70 per cent of agriculture lands are unirrigated and dependent on the rain. The challenge is for assisting the rainfed farmers to improve their economy by the adoption of production system as would not only be economicaly remunerative compared to the traditional cropping pattern but also environmentally sustainable. Raising the output of wheat and rice by introducing high-yielding varieties, application of large doses of chemical fertilisers and pesticides and the concentration of irrigation investment in the development is really burden some. The time has now come for some major modifications in the agricultural strategy in favour of dryland farming.

The increasing demand for food grains makes it imperative to plan for a rational redistribution of area under coarse cereal crops. Cereals form the important component of dry land, tribal and hill agriculture. In 1996-97 the area under coarse cereals was nearly 32 million hectares. Analysis and contigent crop plants should, therefore, be developed for doubling the yield of coarse cereals from the present level of 1068 kg. per hectare in the next couple of years.

Coarse grains are both a food crop and a feed crop. The future of livestock and dairy development largely depends upon the availability of green fodder. Therefore, coarse grains production has multi-dimensional sphere. Special varieties of coarse grains are required to be bred and cultivated now for milling, baking and confectionery as well as for animal feed.

The nutrient composition and technological properties of coarse cereal grains offer a number of opportunities for processing and value addition. So far maize and barley are being successfully exploited. Exploratory studies for the industrial uses of jowar and bajra should be encouraged. The prefix "coarse" to this group of crops seems a misnomer and a stigma which no longer should stay.

— The Tribune, Chandigarh; March 27, 1999.

HORTICULTURE AS AN ALTERNATIVE

By Suraj Bhan Dahiya

Diversification of the Indian agriculture from the traditional land use with predominantly cereal-based cropping systems to more productive and remunerative one has now become a milestone to be achieved. Horticulture provides one of the few viable and most attractive alternative land use systems as part of the diversification strategy.

Horticulture cropsfruits, vegetables, flowers, plantation and spice crops, medicinal and aromatic plants, roots and tuber crops, etc.— cover slightly more than 7 per cent of the gross cropped area, but contribute more than 18 per cent to gross value of the agricultural output of the country.

Apart from their contribution to the total agriculture production, their potential for providing much higher income to the farmers than the cereals has been another major factor for favouring these crops in the diversification campaign. Fruits and vegetable earn 20 to 30 times more foreign exchange per unit area than the cereals. Similarly, in the area of employment generation, these crops have greater edge over other crops.

one noticeable emerging trend involving horticulture in the country is an increase in the consumption of fruits and vegetables. Annual growth in domestic consumption trends of fruits and vegitables is reported to have gone up from 2.5 per cent in 1980-81 to about 7 per cent in the recent years.

Fresh fruits and vegetables have also export demand to countries like the UK, Kuwait, Nepal, Bahrain, Qatar, Dubai, etc. Such demand levels can be achieved only through large-scale expansion of the area under these crops replacing the low remunerative crops in the process. Horticultural activities are set to dominate the Indian agriculture in the next century.

There are at least 30 to 40 fruit crops under cultivation now in our country. Due to over exploitation of lands many indigenous fruit trees had become extinct. However, India still ranks number one country in fruits production with a share of 42.17 million tonnes. The area production and productivity of fruits since 1961 have increased by 3, 6.2 and 2 times, respectively.

India ranks second in the production of vegetables with an estimated area and production of 5.0 million hectares and 6.6 million tonnes. The productivity per hectare is 13.16 tonnes.

Besides cultivated vegitables, there are many wild plants whose leaves, floral buds, flowers or raw fruits are consumed in the countryside on an appreciable scale during seasons of availability.

The world flower market is rowing at an annual rate of 10 to 15 per cent according to an Agricultural and Processed Food Products Export Development Authority report, while India has an annual growth potential of 25 to 30 per cent. During the past decade, in India increasing investments have been made in floriculture as a commercial activity. The availability of diverse climatic conditions facilitated the production of a wide range of flowers all through the year. The bulk of growers are small farmers who still grow flowers only as a small segment in their traditional farming system.

The domestic floriculture scene, comprising the growing of both traditional flowers and contemporary cut flowers, all grown in the open field conditions, generates a trade which is many times higher than the total projected export earnings. The 1989

survey had estimated the trade to be worth Rs. 205 crore annually. As compared to this, the total earnings from export of all floriculture products during 1995-96 was around Rs. 60 crore with cut flowers accounting for less than one-fifth of this trade.

The following table summaries the export of horticultural products of the country.

Products (Rs. in crore)	1996-97 (Rs. in crore	1997-98 (Rs. in crore)	Percentage growth
Fresh fruits	244.40	259.29	06.09
Fresh vegitables	344.38	306.34	08.39
Processed fruits & juices	209.44	281.53	34.42
Processed vegetables	1167.89	1088.84	06.77
Floriculture	63.40	77.50	22.25
Fruit/Vegitable seeds	42.08	56.07	33.24

Punjab and Haryana, which achieved commendable heights in foodgrain production, are now forced to consider diversification as a major alternative for sustaining income from agriculture. The Johal Committee set up in 1986 favoured diversion of about 6.25 per cent of thecropped area in Punjab to the horticulture crops by 2000 AD as against 1.85 percent in 1986. A project was conceived in Haryana way back in 1979 to transform its National Capital Region into horticultural activities to capture the Delhi market. Nothing of the sort is visible in the two states and agricultural crisis persists there.

Farmers have some hesitation in switching over to horticultural crops. They lack in post-harvest management of fruits and vegetables as these are perishable. Secondly, market forces always let them down when they grow bumper crops of fruits and vegetables. Their apprehensions, it seems, are correct. India has been losing 25 to 40 percent of perishable produce annually during postharvest handling accounting for a revenue loss of Rs. 3000 crore.

If our horticulture is to capture the world market, the exploitation of farmers at the hands of market forces will have to be discouraged. And post-harvest technology will also have to be provided to make the farmers realise the long-term gains. A humble beginning has been made in Andhra Pradesh with the Rythu bazar which has given farmers an outlet for their produce, by passing middlemen.

— The Tribune, Chandigarh; May 10, 1999.

FEED, FODDER CRISIS HITS DAIRYING

By Suraj Bhan Dahiya

Next to breeding, feeding is the keynote of livestock development. Dry fodder basically is the bread of the cattle, and green fodder and concentrates are their vegetables and pulses respectively. While the country is self sufficientin foodgrains, surprisingly it is facing the fodder scarcity. There is extraordinary concern over the continued prolonged fodder crisis in India. Unless something is done in this area, the unemployment of

agricultural labourers, who eke out their bread from dairying, will be the the single largest casualty of the next millennium.

The fodder famine has caused tremendous harm to the landless agricultural labourers and the small farmers who in distress are disposing of their milch animals from some time past. Dairy analysts say that a quantitative change for the worse is about to take place in the rural punemployment scenario and it will be a great setback to our dairy farming.

But why has such fodder famine occurred? The agricultural experts candidly admit that the "bhusa" catastrophe could be due to a large scale hybrid crop cultivation. The dwarf varieties of wheat hardly grow up to 2 to 2.5 feet. In contrast, the indigenous varieties of this crop grow up to 7 feet. This desi wheat sown earlier yielded wheat and "bhusa" in the ratio of 1:2 whereas the new varieties now cultivated yield very little quantity of "bhusa". More so the combine harvester used for harvesting the wheat crops now considerably destroys "bhusa" thereby compounding the"bhusa" calamity.

The fodder crops should be harvested when their quality and quantity are optimally matched. However, varieties so far evolved have single object; "grow more grains", irrespective of their fodder attributes. Take the example of bajra which has been our major dry fodder resource for the winter. The hybrid bajra currently sown attains the maximum height of 2 to 3 feet and thus is a poor fodder yielder. In comparison, the indigenous bajra sown until recently ose up to 10 to 12 feet and farmers never felt the dearth of bajra stalks. These stalks are known even today the winter fodder bank. Alas! our fodder banks are empty and the dairy farmers woes are manifold.

There is another anti-climax in the countryside. We do not come across the jungle of sugarcane fields now a days which was a familiar sight in the recent past. Believe it, if a farmer is blessed with a piece of sugarcane field, he neither faces fodder scarcity nor of calorie intake deficiency throughout the winter. There has been shrinkage in the sugarcane crop acreage in recent years. Consequantly the farmers' miseries have multiplied. And they have to procure even the substandard quantity of "Bhusa" at a rate of Rs. 3 a kg. to save their livestock. Neither the animal jusbandary departments nor the agriculture departments of the states are concerned of the shortfalls.

The resources of feed and fodders are available in the country now are far adequate both in quantity and quality to meet to nutritional requirement of our cattle population. In accordance with the nutrition norms laid down, the available feed and fodder are just sufficient to meet the nutritional need of about half of the existing livestock. Because of this limitation, to enhance milk productivity or any product of animal origin, the fodder resources can be so planned as to make available 50 per cent non legumes and 40 per cent of legumes for our stock. This planning can ensure availability of quality fodder for at least 8-9 months. In monsoon, some grazing will be available to supplement fodder requirement for two-three months. The excess of fodder can be made into palatabe silage to regulate the supply of green at the time of shortage.

The present annual requirement of green fodder is around 600 million tonnes, besides what is obtained from grazing. For building up a viable dairy industry nearly seven million hectares should come under fodder crops every year. Sadly, this appears unachievable as dairying does not fall on priority under our agricultural strategies. The animal husbandry departments are pursuing cross breeding programmes for cutting down

the livestock number for which green fodder is prequisite. But the agriculture departments under the influence of the multinationals are advocating for soyabean and surajmukhi cultivation instead of jowar, bajra and mustard crops. There are thus enough indications that dairy farming in the country is heading towards decay.

In Israel, dairy is treated as an industry. With just 1.2 lakh dairy cows, Israel is producing 1.1 billion litres of milk annually. In India, 80 billion litres of milk is produced per year with 10 million dairy animals. Cattle feeding in India is all wrong. All milch cattle here are underfed and all good dairy cattle are being punished.

— The Tribune, Chandigarh; June 28, 1999.

BENEFICIARIES OF CROP INSURANCE SCHEME

By Suraj Bhan Dahiya

In India, agriculture is much prone to the vagaries of nature, the element of risk is much higher here, besides, unlike in the industrial sector, the farmers have two facets of uncertainties; it is prone both to output and price fluctuations. Even a causal look at agricultual policies around the world reveals many surprising anomalies. In the USA for examples, the government pays to farmers not to grow cereals. In the EEC, farmers are paid to grow more. In Japan, rice growers receive three times the world price for their crop. But India, the farmer have neither any protection nor incentive whatsoever, and they are struggling out themselves for the bare living. During the past couple of years, when a number of farmers committed suicide in many states many an eyebrow was raised in various quarters. There was criticism that the state governments had underplayed the crisis. Many blamed the absence of effective farm policies for the crisis, other felt that the farmers were not protected against the losses they suffered on account of poor harvest.

Statistics show that agriculture continues to depend on weather conditions and is exposed to innumerable risks. Since long the demand for umbrella cover through crop insurance had been the key issue in and outside Parliament. Initiative were taken by the government to provide indemnity for farmers whose produce was damaged. Crop insurance for the first time was introduced as a pilot scheme in 1979-80 in limited areas in 12 states. In April, 1985, a comprehensive crop insurance scheme (CCIS) was launched covering all the willing states and union territories.

Crop insurance is a procedure or a contract securing compensation for the loss or damage of crops on payment of premium as decided by the government and the General Insurance Corporation of India (GIC). It offers protection against loss caused by fluctuations in the output of a crop and is now in operation in 15 states and two union territories and aims at providing measure of financial support to farmers in the event of a crop failure as a result of natural calamities restoring the credit eligibility of farmers for the next crop season and supporting and stimulating production of cereals, pulses and oil seeds.

The CCIS covers all farmers availing of crop loans from banks. The insurance coverage which was 150 per cent of the amount of crop loan actually disbursed subject to ceiling of Rs. 10,000 per farmer has since been reduced to 100 per cent of loan disbursed

subject to a ceiling of Rs. 10,000. The premium is 2 per cent of the sum insured for rice, wheat and millets and 1 per cent of the sum insured for oil seeds and pulses.

A major flaw in the CCIS is that some major cash crops such as cotton, sugarcane, jute, tobacco, potato, onion and the like are not under the purview of the crop insurance scheme. Many of these crops are grown by small and marginal farmers in regions susceptible to natural calamities like drought, flood etc. Also important crops like apple, litchi, grapes, mango and banana are also nor covered under the scheme.

However, the fact remains that since the inception of the scheme in 1985, about 58.2 million farmers have been covered over an area of about 99 million hectares insuring a sum of Rs. 16,524 crore of which claims of over Rs. 1,454 crore were paid to the farmers till March 31, 1998, although the premium income was only Rs. 268 crore.

To enlarge the scope of the crop insurance scheme during the 1997-98 an experimental crop insurance scheme covering all small and marginal farmers (both loanee and non-loanee) in 24 select districts of eight states in the country was launched by the government for the year. This scheme covered the farmers growing cereals, including millets, pulses and oilseeds and 100 per cent insurance charges payable by them were met by the central and state governments. The financial liability on account of this subsidy as also the claims of small and marginal farmers were shared between the central and state governments in the ratio of 8:2

In June, 1999, the Government of India launched the Rashtriya krishi bima yojana for all farmers. The scheme will come into force from the forthcoming rabi season in October, 1999. This scheme will cover all crops, including coarse crops of all pulses and oilseeds and in addition three cash cropssugarcane, cotton and potatohave been brought under is purview to start with. The premium for wheat would be 1.5 per cent of the sum insured and for other rabi crops, which are more vulnerable to various calamities, the premium would be 3.5 per cent of the sum insured. The commercial crops and horticultural crops will be covered in next three years.

Initially, the GIC will implement the scheme and later an agricultural insurance corporation of India will be set up to pursue the crop insurance on the permanent basis. The Central Government and all the State Governments will share the expenditure on 50:50 basis. The Central Government will bear the expenditure of Rs. 413.18 crore in the first year, Rs. 239.47 crore in the second year and Rs. 216.17 crore in the third year. The equal amount will be contributed by the State Governments.

The subsidy on the insurance scheme will be taken away after five years. Then it will be taken on actual rates. To begin with, the small and marginal farmers will be provided 50 per cent subsidy on premium. These categories of farmers together have 78 per cent of the total land holdings (105.29 million and operate 53.33 million hectares is representing 32.3 per cent of 165.60 million hectares of land as per 1990-91 agricultural census). When a major agricultural drought or other calamity takes place, the small and marginal farmers are generally the hardest hit. Policy initiative to operationalise various relief mechanisms for the benefit of sustained agriculture development and imporve the lot of small and marginal farmers are already in existence. But they have failed to amelitorate the sufferings of poor peantry. However, crops insurance scheme will prove more beneficial to this class of farmers in part icular and other farmers in general.

— The Tribune, Chandigarh; August 23, 1999.

NEED TO HARVEST MICRO-ORGANISM WEALTH

By Suraj Bhan Dahiya

In India the average farm size is reducing continuously due to fragmentation of holdings and small farm efficiency has been an interminable source of debate. The blooming fields and highly productive livestock here and there do not reflect the overall prosperity of the peasantry, the scenes of low productivity in farms, ill-fed animals and people struggling hard to make both ends meet are not rare.

The general view now is that small size agriculture can maximise per acre employment and output (income) if its micro-organism wealth is harnessed. Dr. K. Hridasan, enthnobotanist at the Itanagar State Forest Research Institute says that multinationals are attacking our priceless micro-organism wealth and we should not allow them to exploit it. Instead, the farming community should be taught the basics of living organisms for better economic life.

For the past couple of years Indian scientists are fighting undeclared wars against multinationals. The Council of Scientific and Industrial Research (CSIR) has a network of around 40 labratories. Most of these laboratories are doing quite well. Take a look at the money they now earn from the industry, or the dramatic increase in the international patents which they have filed from 18 in 1993-94, the number of international patents filed has gone up to 110 in 1998-99. In a vision paper, the CSIR has projected a target of 500 international patents by 2001. By march this year the cumulative figure had already reached 350. What this suggests is that the problem is not with Indian scientists but the system in which they were asked to function.

The challenges now facing Indian agriculture are daunting in that research and extension system as they are practised today are not percolated. Interaction with the domestic industry is still far short of what it could be. The annual industrial production based on the CSIR technology has gone up, of course, but modestly. Far too many domestic companies still prefer intellectual piracy and reverse engineering and so are not willing to either pay for technology and perhaps even absorb it. So technology adoption and dissemination is the biggest problem of our agro-industries. For example, thetechnology developed by the Central Institute of Medicinal and Aromatic Plants for the cultivation of geranium has not reached the farmers. with this technology a farmer could earn about Rs. 1.40 lakh per acre but the farmers take it unbelievable as no industry ensures them for the purchase of their geranium crop for finished poductperfume oil. Consequently, India is forced to import geranium oil over worth Rs. 100 crore annually. So is the case of the guldaudi crop which is in heavy demand in the USA and European countries. It gives an insecticide which destroys mosquitoes, cockroaches, etc.

Technology, therefore, may change the life of farmers but the "lab-to field" programme has completely failed in our country. Almost in every state the agro-industries corporation is functioning but none has come to the rescue of the hapless peasantry. Dr. Sushil Kumar, Director, Central medicinal and Aromatic Plants Research Institute, Lucknow, has demonstated the cultivation of mint at Jennabad village, 11 km from Lucknow. Thirty-year old young farmer Ram Lakhan owns half a acre of land. His five-member family is leading a very happy life on this piece of land by cultivating mint.

The comparative economics of mint farming is very interesting argues Dr. Sushil Kumar. One hectare of potato crop fetches Rs. 20,000, the same amount is got from the wheat or gram crop. But mint crop gives Rs. 40.000 per hectare.

The farmer can earn even more from mint if he installs an oil extracting plant at his farm. After extraction if he converts the oil into crystal form income will go up to four-five times. The future of small farmers thus lies in finished goods of their crops. Does this really bother our government ? Sustainable agriculture in the 21st century will be based on appropriate use of biotechnology, information technology and ecotechnology. Practical achievement in bringing about the desired paradigm shift will however, depend up on public policy support and political action. Not perennial Green Revolution for food production but the gene revolutionfor biological sovereignty should be the aim of Indian agriculture for the 21st century. A new scientific discipline of genomics has arisen. This discipline will contribute to powerful new approaches that can be used in agriculture as well as medicine and will help to promote the biotechnology industry in India. But for this, we have to prepare our small farmers which will be the central force to transform India into a strong economy in the next century. It is, however, essential to take following steps for optimising our micro-organisms wealth:

— The farmers should be educated in this respect through a strong extension machinery.

— Training programmes should be organised for farmers to take up the processing of their raw produce with swadeshi technology.

— Credit and subsidy should be made available to farmers.

— An effective market promotion needs priority.

— The Tribune, Chandigarh; October 18, 1999.

IMPROVE IRRIGATION SYSTEM FOR FOOD SECURITY

By Suraj Bhan Dahiya

Lesster Brown, a foreign expert and noted agriculture scientist, has forewarned, "Agriculturists abroad are predicting that India may have to import substantial amounts of grain once again during the next century." So can we rest our oars, comfortable in the belief that there areno more problems on the food front? Will there be no possibility of a repeat of the humiliation and stress the country and our people had to undergo from 1965 to 1967?

In this regard, we may look at the following table prepared by the Technology Information, Forecasting and Assessment Council, Food and Agriculture Technology Vision 2020.

Projected grain imports in 2000 and 2010

Countries	(Million Tonnes)	
	2000	2010
South Asia	9.2	12.8
East Asia	31.4	39.0
India	6.9	14.1
Pakistan	2.1	4.1
Indonesia	5.7	7.6

China	11.3	21.6

Our apprehension is that the annual growth rate in the Indian agriculture, which had risen to 3.3 per cent during the 1980s, has come down to about 1.8 per centin the current decade as against a population growth of about 2 per cent. It is therefore, essential to study the scenario for domestic demand for foodgrains and other commodities.

"India has to attain an agricultural growth rate of 4 per cent neither for its short-term gains nor for long-term losses but to meet the food demand for all its people," suggested Lesster Brown. Our people and farmers are exceptionally entrepreneurial and have proved it again and again if they are looked after well. But we can belie the gloomy predictions only when we resolve to work hard with a long term vision.

Let us not forget that our existing food security has been mainly brought about by the increase in irrigated agriculture and the introduction of high-yielding varieties of crops. Thus among the determinants of growth of agriculture, investment in irrigation is crucial.

But the new economic environment has been confined only to secondary and tertiary sectors of economy, leaving agriculture in isolation. Without agriculture, mind it, our economy cannot grow at the desired growth. The impressive growth around 6 per cent in the country's gross domestic product in 1998-99 had been due to mainly a high growth of over 5.8 per cent in the agricultural sector. Since we need at least a 7 per cent growth to reach developed country status, for enhancement of agricultural production investment in irrigation cannot be postponed further.

Paradoxically, plan spending on irrigation has declined from 10 per cent in the Sixth Plan to 7.6 per cent in the Seventh Plan to 6.4 per cent in the eighth Plan. The following table further illustrates the point:—

(Investment in Irrigation at constant 1996-97 prices, Rs. in crore).

Period	Medium	Minor
1985-92	29332.8	16308.2
1992-97	31057.6	17302.5
Command area development		
1985-92	3684.9	49325.9
1992-97	3162.9	51523.0

The exercise on invstment in irrigation is mind boggling. Even by estimating the cost of irrigation at Rs. 1 lakh per hectare— the World Bark's estimate is Rs. 3 lakh per hectare— it would cost Rs. 2,50,000 crore to irrigate 25 million hectares with irrigation potential, said Ashok Gulati, an agriculture economist with the Institute for Economic Growth.

"It would take 50 years to irrigate the 25 million hectares if the government continues with its annual investment of Rs. 5,000 crore of irrigation", he explains.

The grim situation is that in spite of having abundant wate resources in the country we have failed to channelise them optimally. Huge investments have been made in the canal system, yet output-wise the results are in the "red". A cultivator today is sandwiched between canal officials and the revenue authorities. Canal engineers' commitment to update the canal irrigation system is lacking. Consequently, instead of good revenue source it has become liability. In some states when the irrigation engineers

failed to deliver the goods, villagers themselves tookover the water management and they proved to be good managers.

In a village near Aurangabad in Maharashtra villagers with the help of some voluntary agencies have transformed the face of the village from drought stricken to a green one. This is a very good example of economic management of scarce water.

Water is a very precious commodity. It is pity that no worthwhile research work has been carried out to harness this natural source economically. Rain water, though available in plenty, is allowed to go waste every year by the state irrigation departments having a large army of engineers.

The inter-state water disputes too continue to linger on with no signs of settlement, resulting in crisis in many states: financial, political and social. India with its vast water resources can make miracles happen if there is strong will to do so.

— The Tribune, Chandigarh; November 22, 1999.

BASMATI RICE IS OF INDIAN ORIGIN

By Suraj Bhan Dahiya

In the new world of globalised production and markets, of the General Agreement of Tariffs and Trade (GATT)-supervised "free" trade, dominated by the intellectual property rights (IPR), India is getting perennial shocks. India's policy makers have clung to such delusions even in the face of painful experience with technology control and IPR-related bullying in their dealings with the West: the patent granted by the USA to Rice Tec for basmati debars others from selling the rice under the brand name of basmati. Dukel's GATT, thus, will continue to extend its claws over India's traditional agriculture.

For over a year, farmers, scientists and non-government organisations have been protesting against the patenting of a variety of basmati rice by a US firm. India claims to have 11 indigenous varietis of basmati. India is negotiating with world agricultural scientists over the definition of basmati through the Union Commerce Ministry. The samples and rice breeding history have to be supplied.

It is strange that foreign scientists argue that basmati has a customary name but but no history at all. Therefore, they are reluctant to accept at face value India's insistence that all 11 varieties as basmati under the Seed Act have the genetic qualities of what is taken as the real grain. In case, the foreign scientists decide to ignore India's interests because of our government casual approach domestic agro-industry stands to lose the huge volumes of basmati export. Let us look into the long breeding history of the basmati crop.

It is a well known fact that paddy was the first crop cultivated on the Dharmkestra (Kuruksetra) soil. Legend is that the forefathers of Kaurva and Pandvas, King Kuru had ploughed the field of Kurukeshtra to start farming. God Vishnu had sown the field with the rice and blessed the king that the region would continue to harvest the finest paddy. The piece of land which had been brought under rice cultivation for the first

time by King Kuru was Bir Baraswan, still existing in Pehowa block of present Kurukshetra district. So initially it was the cropfield of King Kuru who called it Kuru "vansvati" which later corrupted to vasvati and then basmati. Thus, the rice cultivated here earned the geographical speciality with the classic name ofbasmati. The history of basmati finds mention in Indian scriptures too.

In ancient time Kurukshetra, having characteristic soil texture, was irrigated by the mighty Saraswati. Probably climatic conditions were also so conducive that the soil yielded long grained superfine rice. King Kuru felt privileged to serve this rice to saints and sages who had their hermits on the banks of the river. From here, the basmati variety was later taken to the other parts of the Aryan land. Even now true basmati is the Indian subcontinent crop and is mainly grown in Haryana, Punjab and some areas of Pakistan.

Basmati means "Bas" and "mati" i.e. flavour of the soil. Comparably, basmati of the Pehowa belt of Kurukshetra district even now is far superior in fragrance than the basmati of other regions of India and all exotic varieties. The Kurukeshtra brand basmati rice has a trade mark the worldover and fetches more price in export business. So it is an indigenous produce. Sadly enough, even with ample historical evidence India slipped away on the basmati patent. At present, the patent facilitating cell appears to be the victim of what most science and research institutions lack in India: low political temperament.

While signing the Dunkel Draft Text the government of India's stand was that the farmers' rights would be safeguarded and a major beneficiary will be India's own agricultural research institutions. But the experience has been just the opposite.

Today basmati is the best genetic material of rice having origin in India and it has been robbed of by the US firm. Quite rightly the exclusive rights on this genetic base should have been with India. The historicity of basmati should, therefore, be documented immediately to fight for its patent battle like the one we fought for the turmeric patent; after all, India must tone up its patent facilitating agencies and patent research organisations and learn to use patents as a business tool.

The collapse of the World Trade Origanisation talks at Seattle does not bring everything to a standstill. Negotiations on agriculture and services, mandated reviews, on trade-related investment measures and IPR will commence as scheduled on January 1, 2000. India dominates the world basmati market today and the world bodies are asking for original samples of indigenous varieties of basmati for the creation of a globally characteristics. But it seems we have yet to prepare ourselves for such a request.

—The Tribune, Chandigarh; January 3, 2000.

PULSES CULTIVATION NEEDS ATTENTION

Suraj Bhan Dahiya

Indian diet primarily consists of cereals and pulses. According to a recent finding, proteins and protective foods are not available to the average Indian. If every one is given a balance diet there will be a shortage of 27 per cent of foodgrains and 50 per cent of pulses, besides huge deficiency of fruits, vegetables, oil, fats, milk, etc. The rate of improvement in the case of protein rich pulses leaves much to be desired.

On the contrary, over the years the availability of pulses in India is declining from 64 gm per capita per day in 1951-56 to less than 40 gm today as against the Food and Agriculture Organisation's recommendation of 80 gm. If we take into account the total protein nutrition derived from other protein sources such as foodgrains, milk, egg, fish, meat, etc. then 50 gm per capita per day requirement of pulses may be the realistic target. As a result of inadequate protein consumption, a majourity of our working forces is lethargic and sluggish. It is estimated that the country's population will touch about 135 crore by 2020 A.D. The country would then need some 30.3 million tonnes of pulses as a minimum essential for a healthy active life.

The total area under pulses remained virtually stagnant (22-24 million hectares)with almost stable production (12-14 million tonnes) over the past four decades. The stagnation was due largely to lack of any breakthrough in yields, crippling their competitiveness vis-a-vis alternative crops for acreage. Because of low yield, pulses have been pushed more and more towards marginal and low productivity lands. Pulses are energy rich crops but are cultivated largely under energy starvation conditions. More than 78 per cent of the area under pulses is still rainfed.

During the eighties, when India is set to be the major global player in the 21st century, the pulses were mandated in the oilseed technology mission. Though the mission has lost much of its vitality some improvement in the productivity after the release of dozens of improved varieties of pluses has, however, been noticed during the past couple of years. The production has gone up from 14.24 million tonnes in 1996-97 to 15.90 million tonnes in 1998-99.

A little impetus is needed in pulses production now. There is good scope for expansion of area under pulses in various cropping systems where production can be increased both by horizontal and vertical expansions. With the new technology developed at least-12-13 million hectares can be added which will help in increasing pulses production by 5-6 million tonnes.

Pulses have secondary status in the farming system. Farmers generally grow pulses on sub-marginal lands, mainly for their own needs. Interpreted in terms of future needs, the minimum goal of nutrition implies that for every 10 million increase in population, India would have to increase the pulses by 60 per cent. Above all, more and more people the worldover are switching over. to vegetarian diet, the demand of pulses from India would go up appreciably in future. Pulses are also important in livestock feeding. The potential for the use of pulse legumes as well as forage legumes in maintaining soil fertility is also great in the county. Attention is, therefore, necessary for their improvement and substantial increase in their production.

Last year when India's agricultural exports showed generally decline trend—down by 9.5 per cent in the first half of 1999 those of pulses looked up firmly clocking a whopping 56 per cent rise in dollar terms. Apparently pulses export from India has managed to strengthen its position in the international market.

Quite rightly, India has an edge over other pulses producing countries in terms of both capacity as well as quality of pulses' processing This would make it possible to import raw pulses also for re-export after processing and with value addition even if domestic output and demand are evenly matched, Such strategies are very commonly

adopted by the leading nations and if India is to attain world power status it has to follow this art of trade.

— The Tribune, Chandigarh; February 7, 2000.

DROUGHT PROOFING IS AN ENGINEERING

By Suraj Bhan Dahiya

In the Drought Problem in India in relation to Agricultute", Annals of Arid Zones Vol. II, A.M. Malik and Govindaswamy define drought as occurrence of four or more consecutive weeks, with the actual weekly rainfall equal to or less than half of the rainfall in a given subdivision in a normal season. Meterologically, however, drought in an area or place may be defined as a situation when the annual rainfall in that area is less than 75per cent of the normal rain fall, It is further classified as "moderate drought" if rainfall deficit is between 25 and 50 per cent and "severe drought" when it is more than 50 per cent. Areas where frequency of drought as defined above is 20 per cent of the year examined are categorised as " drought areas" and areas having drought conditions for more than 40 per cent of the year under consideration represent "chronically drought-affected areas." Loveday says: " History gives no example of a drought extending over the whole India; and meteorologists declare such an event impossible." During the past 300 years we have experienced 26 major famines, during the past 700 years there have been 17very severe food disasters and during the historical times of 34 great famines of the world 18 have occurred in India. The frequency and cyclical order show the peculiar susceptibility of this country to crop failures and recurrent shortage of food and fodder supply.

Probabilities of erratic rainfall based on coefficient of occurrence of low rainfall reveal that South-Western parts of the country have been more prone to famines and droughts. As per rainfall data available for the year 199-2000, 139 districts in the country had very low rains. In all, 11 states are facing drought of diferent magnitudes, however, the severity of drought is extreme in Gujarat, Rajasthan and Andhara Pradesh. During the monsoon period last year Gujarat had 38 per cent less rains; in 11 districts it was very low while in four districts virtually there was no rain. Rajasthan experienced 17 to 24 per cent deficient rains and in 14 districts rain was very scanty. The shortfall of rains in different states is given below :—

State	Districts having grossly inadequate rains.
Tami Nadu	19
Uttar Pradesh	14
Orissa	13
Haryana	12
Karnataka	10
Andhra Pradesh	08
Madhya Pradesh	07
Maharashtra	07
Himachal Pradesh	03

The occurrence of drought in Gujarat is the most tragic historical feature in the revenue administration of the state. More than 9,500 villages in the state or more than 40

million people have been declared droughthit. All sources of water have dried up in the Norhtern and Western parts of the state. The poor monsoon rains damaged crops worth Rs 3,000 crore in large areas of Saurashtra.

The worst drought in 100 years has dried out all wells in Hadiyana, a coastal settlement in Gujarat, and a few can afford to buy water on sale. In Saurashtra people have been rioting for drinking water.

People subscribe that the loss of cattle due to this drought is much greater than it used to be in the last century. Not a blade of grass is visible and thus miseries of the people are severe and manifold in Gujarat.

A tragedy about a century and a half old has stepped out of memory's nightmarish shadows in Rajasthan. The year 2000 brings back memories of "chappaniyo dukal" or the grat famine and drought of 1856. For Rajasthan this is the second straight year of drought where precious water has disappered in 26 of the 32 districts. Report from district collectors show that 23, 406 out of 34,694 vilages are affected. The loss of crops ranged from 75 to 100 per cent. The human population affected in these districts numbered 261 lakh and the livestock affected is 345 lakh. The present drought has shattered the state's economy. the farmers are seeking loans at exorbitant rate of upto 60 per cent of interest for their survival.

The spectre of the current drought is looming large over Mr Chandrababu Naidu's silicon state, Andhra Pradesh. The Telugu Desam government known for information and technology did not visualise the intensity of the calamity. The government's estimates on crop loss this year in the state are worth Rs 2,566.91 crore. The state has declared 16 of the 23 districts as "drought stricken". Farmers in drought-prone areas are resorting to distress sale of cattle because they are unable to feed the animals. Thirtyseven suicide cases have been reported from the state so far.

For planners and administrators it is perhaps the biggest challenge of the millennium which, if not tackled defltly, could lead to a disaster that the country has not witnessed for a century or more. The system of the present relief measures are dictated by the famine codes of 1883. The famine relief policy of the British time was based on the maxims laid down by Turgot and J.S. Mill. Turgot said:" The best and the most useful kind of alms consist of providing means to earn them." Though such measures are neccessary, yet not sufficient in the present-day economy. Redemption seems far away as the state treasuries are dry and the vision of drought management is not proactive: one has to shift attention from drought as a food crisis to an economic crisis. Prof. Amartya Sen rightly says that in drought conditions people's miseries multiply as the state apparatus virtually collapses and the scrupulous elements get into for exploitation.

Mr. Anil Aggarwal, Director of the Centre of Science and Environment, tells us that this drought is govern-ment-made catastrophe. It is a sorry reflection that there is literally no rain water harvesting in our country and investment on the irrigation system continues to decline year after year. Modern drought managment experts find relevance in today's sense what is codifed in Kutilya's Arthashastra: "During famine the king's duty shall be to show favour to his people by providing them with seeds and provisions, favour by distributing either his own collection of provisions or the hoarded income of the rich among people or seek for help from his friends among kings, or the policy of thinning the

rich by extracting excessive revenue, or causing them to vomit their accumulated wealth."

There was a terrible drought in the offing in Gujarat and Rajasthan was evident way back in September last year when people had begun fleeing their villages. But the governments there did not react promptly and rightly. Neither the government of Gujarat nor Rajasthan took pains to introduce crop insurance scheme and they did not help the farmers to get kisan credit cards to meet their urgent financial requirements. Recall the scheme of famine insurance grant introduced in 1878 and in the annual budget of the Government of India a provision of Rs 1.50 crore was made with a view to forming a permanent fund for drought management. The Jaipur Maharaja donated in 1900 Rs 15 lakh in government securities to be held in the trust for times of general distress. This was officially known as Indian People's famine Trust. Such mission can be launched at the district level even now.

Now when we are waging a war against hunger and thirst, the country must mobilise all its resources to meet the most daunting challenge it faces since Independence. A cohesive information campaign has to be developed as part of the strategy to fight drought conditions. Sadly enough, the government machinery is still busy to suppress the news of hunger deaths to ensure that the system works well. Ground realities are that in Gujarat and Rajasthan, half of the livestock wealth has perished. The farmer's deaths have gone close to half a century.

The British style drought management would not solve our all problems. We have to invariably fight outdated government precepts and codes. The people need quick dose for revival of their economies. Drought proofing is an engineering and political challenge, let us face if with su date skill and vision.

— The Tribune, Chandigarh; May 22, 2000.

AYURVEDA POISED TO TRANSFORM INDIA

By Suraj Bhan Dahiya

India has been using medicines derived from plant extract for more than 5,000 years and practitioners of traditional medicines look after the health of almost three out of four persons. Besides thousands of village-based suppliers of herbal medicines, India has more than 40,000 licensed medical practitioners of the codified system of indigenous medicines.

The World Health Organisation (WHO) has estimated that up to 3.5 billion people in the developing countries rely on plant-based medicines for primary healthcare. Ayurvedic healers in India itself use more than 1,000 different plants.

Despite being a treasure trove of rare medicinal plants and birthplace of three therapeutic systems, India's share in the Rs 51,500 crore herbal industry is less than 1 per cent.

Now the demand for herbal medicines is storming the Indian Ocean. In the Europen Union alone the demand has grown more than 5 per cent a year since 1990. An Exim Bank of India study estimates word trade in medicinal plants at more than $ 60 billion a year. While countries in the West are carrying out extensive research on Indian medicinal herbs and even obtaining patents, India's herebal exports total an abysmal Rs

370 crore, thanks to the government apathy and lack of interest of our agricultural scientists.

The Indian Government has been little slow to recognise and protect its indigenous innovation and knowledge as collective heritage and many countries were smart enough to pirate our ayurvedic wisdom of neem, bhu, amla, karela, sharifa, haldi, angoor, Indian mustard, kathal, adarak, kala jeera, kumari, amaltas, brahmi, carden balsam, jangli, pomegranate, kali mirch, arand, black night shade, choulai, harad, ber, isabgol, etc. These countries have got patents on ayurvedic usage of these plants also.

"The government has no longterm sustained planning regarding the herbal industry," rues Arif Hussein, Marketing Manager of Hamdard Wakf Laboratories. A study says that no less than 75 per cent of medicinal plant collection is from the wild but in India, indiscriminate deforestation of 165,000 hectares every year is destroying our invaluable genetic stock. Nearly 100 medicinal plants are facing extinction in the country and the government, of late, has to ban formulations derived from some 84 plants.

While many small-scale manu-factures of herbal drug are being forced to down shutters due to a harsh taxation policy, bigger players are facing problems in upgrading their products due to lack of funds for research and development (R&D). During the last Plan period, the government allocation for alternative medicines (ayurveda, sidha and unani) was only Rs 36 crore com pared to Rs 1,000 crore for allopathy.

Lack of government interest in the R&D in the herbal industry is evident from the fact that the USA has conducted more clinical trials on neem than India. It is pity that we wait for the Food and Drug Administration in the USA or WHO to endorse the veracity of our medicinal products. Nevertheless, major players in the Indian harbal market like Dabur — where ayurveda constitutes 90 per cent of the total turnover of Rs 810 crore have undertaken elaborate R&D projects. But they are meant to show the right path to our government.

"China, India and Brazil are the pricipal suppliers of medicinal plants to the world," says Ronald Watkins, Chairman of Plant Science International of the UK. As herbal medicines become more and more popular, many pharmaceutical companies in the West are developing drugs based on natural plant material. Watkins says there is growing concern about side effects of synthetic drugs.

China, holding the largest share of the world herbal market, has become an erratic supplier. This provides India a great oppourtunity to have sway over herbal trade. India is the only country where every botanical species known to mankind is to be found. But to raise the export of medicinal plants in a big way, it must encourage sustainable commercial scale cultivation.

According to the Manila-based Biodiversity Conservation net-work, there is danger of 25 per cent of all plant species becoming extinct in the next 50 years because of failure of policies. Realising advantageous geographical factors of India many global pharmaceutical companies in the West are searching for a base here. Biopharm of the UK has already formed an alliance with Rallis of India for cultivation of some medicinal plants.

Warning of economic unrest in the developing world in the times to come the thrust area of India should be on enhancing herbal harvesting using all available tools of

advanced sciences like biotechnology and genetic engineering. The agricultural universities should widen the base of the R&D on herbal crops. Herbal engineering and herbal cultivation study should be introduced as new courses in the universities.

Commercialisation of herbal crops in the country will prove boon to the farmers. In the international conference on biotechnology for sustained productivity in agriculture held at Hyserabad in November, 1999, it was revealed that it is truly amazing that Indian farmers are fully conversant with the ingredients of herbal crops and their utilities. They may be true leaders of tomorrow word if they are supported to grow herbal plants as a commercial venture for meeting the requirement of manufacturers on one side and diluting the balance of payment difficulties of the country on the other side. Ayurveda and the Aryans (cultivators) possibly may bring back the "Golden Sparrow" glory to India in the coming century.

— The Tribune, Chandigarh; June 26, 2000.

CANAL IRRIGATION MANAGEMENT NEEDS RELOOK

By Suraj Bhan Dahiya

The current drought conditions in some parts of the country testify that life in India even now is much dependent on the monsoon. If monsoon fails there is lockout in the agricultural industry; a disaster which calls forth the virtues of patience, fortitude and charitable ness. Irrigation, therefore, forms the datum line for sustained successful agriculture in the country. In fact, as pointed out righly by Sir Chrles Trevelyan, "irrigation is everything in India: water is more valuable than land, because when water is applied to land it increases its productivity at least six-fold and renders great extent of land productive which otherwise would produce nothing or next to nothing".

India has the largest canal system in the world. Indian canals — the biggest irrigation source — cover an area of over one lakh kilometre and irrigate about 30 per cent of the total net area irrigated. About half of India's net canal irrigated area lies in Uttar Pradesh, Punjab, Haryana and Andhra Pradesh and another half falls in West Bengal, Tamil Nadu, Bihar , Rajasthan, Madhta Pradesh, Karnataka, Assam, Maharashtra, Orissa, Jammu and Kashmir and Gujarat. In the vast irrigation complex of the country, the irrigation canals of Northern India rank amongst the greatest and most beneficient triumphs of modern engineering in the world.

In spite of the fact that India blessed with one of the largest water supplies of any country, water famine continues to loom over the nation. Cities, towns and large rural tracts complain of dry taps, dry wells and dry hopes. Aqua experts predict tougher days ahead.

Suggestions for a national water grid envisaging inter-linking of rivers with a view to transferring surplus water available in some regions to the water-deficit areas have been made from time to time. The Government of India prepared a national perspective for water resources development in August, 1980, envisaging inter-linking between various pensular rivers and Himalayan rivers for transfer of water from water surplus basins to water-deficit basins for optimum utilisation of water resources. The government established the National Water Development Agency (NWDA) in 1982 to

firm up these proposals. A total of 36 water transfer links; 17 under peninsular components and 19 under Himalayan components have been identified by the NWDA.

Water management is regarded as a "must" in agricultural technology. It is necessary to see that our water supplies are put to utmost efficient use. In surface irrigation, using the distribution system consisting of main canals, branch canals, field channels, etc., it has been estimated that 40 to 45 oer cent of the water entering the distribution system is being lost into earth by percolation before reaching the field, and half of the water given to field is lost before it gets to the roots of the plants. Therefore, canal irrigation in the country requires considerable improvement.

Irrigation is not only a science but also an art in itself. While agricultural land forms the body, water is a vital fluid that sustains our agrarian economy. Timely supply of this vital fluid is getting precious day by day.

Through conservation of surface water parchaed lands of some areas of the country are being watered round the year. But it is very surprising to note that four-fifth of India's water resources come from the system flowing into the Bay of Bengal, while the waterless region of Rajasthan is provided, with nothing at all. Irrigation works have nevertheless been constructed to bring more and more area under irrigation and to guard against possible failure of rains. Expansions of irrigation facilities along with consolidation of the existing systems has been the main strategy for increasing production of foodgrains. With the sustained and systematic development of irrigation, irrigation potential has increased from 22.6 million hectares in 1951 to about 89.56 million hectres at the end of the Eighth Plan (1992-97)

Some inter-state water disputes have, however, come into the way to accelerate the irrigation facilities. Efforts are made to resolve disputes by negotiations amongst states concerned with the assistance of the Centre. Adjudication through tribunals is also resorted to when warranted.

So far the following Tribunals have been appointed to resolve inter-state water disputes: Godavari water disputes tribunal, Krishna water disputes tribunal, Narmada water disputes tribunal, Cauvery water disputes tribunal and Ravi-Beas water disputes tribunal. The first three tribunals have given their final reports. The Ravi-Beas water tribunal gave a part report on January 30, 1987. The dispute is still under adjudication by the tribunal.

To avoid inter-state water disputes, the Government of India now is seriously considering to move water resources from the State List to the Concurrent list. Another important issue getting Central Government's immediate attention is how to generate funds for the water projects.

The Government of India is of the opinion that water used for irrigation is presently priced very cheap and the prices vary from region to region. The view is that if water is priced reasonably it wouls not only raise revenue to supplement the cost of irrigation projects but would also discourage farmers to draw excess water. The important fact to be noted is that wherever canal water is available to the cultivator for irrigation he invariably resorts to over irrigation. It has caused waterlogging and salt effervescence. Virtually one-third of India is now floating under water. On the other hand, 62 per cent of the net area sown in the country comes under dry land farming.

The national water policy, 1987, states that the water rate should be such as to convey its scarcity value to the users and motivate them in favour of its efficient use, besides, at the same time, being adequate to cover annual maintenance and operation charges and a part of the fixed cost. Most of the states have not revised water rates for the past two or three decades.

In the context of development planning with a preponderant accent on food production, water rates should not be determined on the basis of investment made on irrigation projects. An incentive to ensure increased production can be given by not imposing high rates but with provision of free water in areas of low productivety. It is suggested that regional water rate boards should be set up to fix irrigation water rates according to the productive capacity of the area and to act as tribunals to settle disputes on irrigation rates.

— The Tribune, Chandigarh; August 7, 2000.

INDIAN GUR GETS GLOBAL GLORY

By Suraj Bhan Dahiya

India is the largest producer of sugar in the world. Sugar is the second largest industry in the country after textiles. Among the sugaryielding crops like sugarcane, sugarbeat, palms and sorghum, sugarcane is the most important. It being a commercial crop, needs to be handled in such a way that it meets the requirements of the industry, besides giving high returns to the farmers.

Sugarcane is grown under diverse conditions on about 4.1 million hectares encompassing areas of Tamil Nadu in the South, Punjab in the North, Gujarat in the West and Assam and Nagaland in the East. However, 90 per cent of its area and production is in eight states — Bihar, Haryana, Punjab, Uttar Pradesh, Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu, Uttar Pradesh accounts for 51 percent of area and 46 per cent production fo the country.

During the past five decades though sugarcane production has inqreased more than two-fold, the sugar recovery has not shown any upward trend. It has always been hovering around 10 per cent. Currently, on an average 47 per cent of sugarcane is utilised for sugar production and about 40 per cent for gur and khandsari.

But at present, the Indian sugar industry is facing a tough competition in the international markets. The cost of sugar production in India is about 30 per cent higher than the international market price. Sugar and its by-products play now a pivotal role in our agro industrial economy and share 2 per cent of the gross domestic product.

In the changed global scenario, however, the sugar industry has a bleak future. It essentially, therefore, necessitates a rethink of the judicious use of our sugarcane cultivation. Before studying the economics of sugarcane cultivation in the context of immediate future demand, let us look into the projections of sweetener requirement vis-a-vis sugarcane and sugar production in India from the following table.

(In million tonnes)

Year	Sweetner Requirement				
	Sugar	Gur	Total	Sugarcane	Sugar
1990-91 (actual)	12.40	9.00	21.40	241.00	12.05

2000	18.00	13.70	31.70	300.00	18.90
2010	22.17	16.81	38.98	348.50	22.48
2020	27.29	20.69	47.98	415.00	27.39

The scientists have now proved that the intake of sugar is injurious to health while consumption of gur is essential for good helath. Hundred gm of gur contains 0.4 gm protein, 0.1 gm fat, 80 mg clacium, 40 mg phosphorus, 11.4 gram iron, 0.6 mg to 1 gm minerals, 168 mg carotene, 0.02 mg thymum., 0.05 mg vitamin C and 383 kilo calorie energy in the form of carbohydrates. In contrast, except carbohydrates all valuable vitamins and minerals, etc are missing from sugar. While gur has medicinal values, sugar leads to cancer, heart attack, obesity and phyorrhoe.

The diet atlas of India reveals that in the case of sugar and jaggery, Punjab and Haryana top the list— on an average 85 gm is consumed per day per adult. West Bengal and Maharashra come next with 40 gm each. In rest of the states consumption level of sugar, etc is very poor. However, the most unsatisfactory feature is that intake of jaggery declined considerably among the agricultural labourers when they started receiving wages in cash instead of traditional wages in kind and food. As a result of inadequate jaggery consumption, there is poor development of physique of the agricultural labourers and their working efficiency has deteriorated.

Now India should concentrate on gur production instead of sugar. Due to heavy competition for food, fibre and oilseeds, there is little scope for increase in the area under sugarcane to meet the increasing demand of gur. Therefore, the only alternative left is to increase the productivity of sugarcane and gur by adopting efficient managment practices for sugarcane cultivation. The average yield of sugarcane in different states during 1997-98 is given below.

State	Yield in tonnes/hectare
Andhra Pradesh	72
Bihar	41
Gujarat	72
Haryana	53
Karnataka	91
Kerla	93
Maharashtra	33
Orissa	61
Punjab	56
Tamil Nadu	106
Uttar Pradesh	65
West Bengal	70

Research and development efforts properly organised should help improve the yield levels throughout the country. There is more scope in this regard in the North than in the. South target yield level would be 75 tonnes per hectare in the North and 100 tonnes per hectare in the South. Varieties have to be bred for gur for highest possible gur recovery.

"Gur gur reha, chela sakkar ho giya" goes the old saying but sugar has lagged far behind. Gur has always got respect in Ayurveda. The usefulness of it has now been recognised at the international level.Kudos to our gur as it has been branded as "millennium gur" and is in great demand in 23 countries, including the USA, Japan, Canada, Hong Kong, Germany, etc. In the recently concluded 88th India Science Congress in New Delhi, the sci entists impressed upon the use of new technology integrating the traditional knowledge in the preparation of gur. This will move India from the green to rainbow revolution.

Dr. Jaswant Singh Institute of Sugarcance Research has revealed that gur is being trans formed into chocolate, liquid gur, and granulated gur for export. The technology of liquid gur has been developed at the Regional Sugarcane and Jaggery Reserch Institute, Kholapur. Granulated gur is manufactured at the Regional Research Station, Anaukpalli and gur cubes would soon take the place of sugar cubes in starred hotels. This isa welcome sign for the oppressed peasantry of the country.

— The Tribune, Chandigarh; January 15, 2001.

SOS CALL FOR SOIL REJUVENATION

By Suraj Bhan Dahiya

Beware! Indian soil is about to exhaust. Under the prevailing conditions, in the immediate future it will not be able to feed over billion human mouths, forget the other species— livestock, bird, etc. The rate of soil exhaustion, which takes place in the normal process of agriculture, is not being replenished through natural and artificial methods.

Land is actually like a living being.It gives nourishment to crop and in return calls for nourishment. The requisite inputs are water, manure, seed and human or cattle labour. Mr Charan Singh in his book, 'Joint Farming X-Rayed', tried to explain this philosphy more lucidly, "Soil is like a bank. You cannot take from it more than you deposit. Nature permits no overdrafts. Hence not only the fertility of soil is to be conserved but also enriched."

The biggest culprit of our soil degra-dation is the indiscriminate use of chemical fertilisers and pesticides. The extensive use of chemical fertilisers had led to the depletion of the soil carbon; the organic matter in the soil. This had reduced soil fertility and per hectare yield. In tropical countries like India, the problem is aggravated by the fact that the soil carbon is 0.5 per cent against 4.5 per cent in cold countries. To increase production and obtain higher yields farmers here are compelled to use increased quanitity of chemical fertilisers. This further diminishes soil fertility and increases the use of chmical fertilisers. Without realising that they are trapped in a vicious circle, farmers run after short-term gains, while their land experiences permanent and irreparable losses. Therefore, it is high time that India should abandon four to five decades' practice of using chemical fertilisers and revert to age-old use of organic fertilisers.

India has a large animal kingdom and a way out of this desperate situation is to use cow dung and animal wastes as manure. It has been estimated that the cattleshed manure supplies nearly 10 times as much nitrogen and phosphoric acid to the soil as other manures and fertilisers. The amount of cattle dung annually available is 2100 million tonnes, of which 700 million tonnes is used as fuel and 320 million tonnes

as manure, the balance is being wasted. Swami Daya Nand in his book 'Gou Karunanidhi' had written, "With one cow beef at the most 80 non-vegetarian people can have meal only once, but the cow in her life span provides a meal for 4,10,440 people." Even human waste is also a manurial resource. Calculated at the rate of one kg of nitrogen which night soil expelled from the body of one person on an average produces in a year, one billion people produce 10 million tonnes of nitrogen.

The Chinese regard night soil as a property to be cherished rather than as waste material which is thrown away.

The tiller of the soil was aware of the various virtues of organic fertilisers. But he was forced to switch over to chemical fertilisers and he is now the biggest loser of his land capital. The onus, therefore, is on the government as well as agricultural scientists to reimpose in him the faith for organic farming. It is cheaper and the remedy to all soil problems. Research studies have concluded that dung of a cow may give 1,460 tonnes micro-nutrients annually which is sufficient to enrich soil structure and fertility of 14.6 acres. We must also wake up to the need of using the indigenous seeds. The quality and characteristics of our seeds have been proved for agricultural crops. They are superior in yielding good crops even in varied climactic conditions. They do not destroy humus and degrade the soil, but always behave to preserve the eco-system. Unlike exotic seeds they are neither prone to disease nor they require pesticide application. Unifortunately our indigenous seeds have been pirated at a mass scale leaving our gene coffer empty.

The Council for Advancement of People's Action and Rural Technology (CAPART) has now launched a movement throughout the country to save the local varieties of seeds. CAPART is taking up various projects for identification of traditional seeds and promotion of farmer-based gene pools. It has also been stressed that simultaneously information should be collected about traditional agriculture practices from the farmers of the old generation.

Chipko Movement coordinator Dhoom Singh, while launching the "save seeds" campaign, says that in Uttaranchal there were over 3,000 varieties of rice and now only 129 are abailable. Likewise, out of nearly 20, 000 rajmah varieties, hardly 110 have been left. Also out of the nine varieties of wheat and eight varieties of peas, just three or four of each are found now.

The most important input— water — is becoming a scare commodity day by day. To preserve water we have again to look into our ancient philosphy. "For trees mean water, water means bread and bread is life. And one tree is equal to 10 sons." And finally the wisdom of our peasantry which shows the way to save the soil. In a tribal area, a farmer explains the importance of mulching the soil by arguing that it is as necessary as the sweater for the body in winter. He further emphasises on the companion plantation. The tribal famers, for example grow castor, beans, tumeric and chill over a piece of land simultaneously.

The companion planting and conservation of soil are no longer at logger heads. They have to go hand in hand. We must endorse this view and should seek counselling of such farmers to preserve the fertility gradient of soil.

To conclude, agriculture in India lacks in organisation and leadership. It has never offered phonomenal prosperty to anybody like industry. Hence, farming has

become short of marginal enterprise, or more correctly a deficit economy, so for our survival the ferment call "save the soil" should come now.

— The Tribune, Chandigarh; March 12, 2001.

GROUND WATER CRISIS IN THE OFFING

By Suraj Bhan Dahiya

As much as 87 per cent of the annual fresh water supplies in low-income countries is consumed in agriculture, while the middle-income countries use three-fourth of the available water. On the other hand, the highincome nations use 59 per cent of their water resources for agriculture.

The water situation in India seems to be going from bad to worse. Not only is there a growing scarcity of water in the country, the agriculturally-important states of Punjab, Haryana, Tamil Nadu and Rajasthan are facing a steady fall in their ground water levels.

While the per capita water availability in India in 1947 was 6008 cubic metres a year, 50 years later it was down to 2266 cubic metres. This is still above the danger level that is 1700 cubic metres when the situation is designated as water stress. The water scarcity level is reached when the per capita availability goes down to 1000 cubic metres and it is absolute scarcity at 500 cubic metres. These are the findings of a study conducted by the Tata Energy Research Institute (TERI).

Depletion of the ground water level, however is a cause of concern for India as its agriculture depends over-whelmingly on this source of water. One estimate has it that ground water source account for as much as 70 to 80 per cent of the value of agricultural produce attributable to irrigation.

Since agriculture contributes nearly 29 per cent of India's gross domestic product (GDP) with produce from irrigated areas being the mainstay, the availability of ground water and the health of the GDP are vitally interlinked, which is all the more reason why the country should pay due attention to its depleting ground water resources, the TERE study states.

However, there remains a contradiction over ground water exploitation in India. While the ground water availability is already a serious problem in a few states, the problem of its overexploitation doesn't exist at the national level.

The danger bell is already ringing for Punjab that has reached an exploitation level as high as 98 per cent against the critical level of 80 per cent. Haryana has an exploitation level of 80 per cent, Tamil Nadu over 60 per cent and Rajasthan 53 per cent.

Six of the 12 districts of Punjab and three of Haryana have already crossed the optimum ground water utilisation rate. Mehsana district of Gujarat and Coimbatore of Tamil Nadu are probably beyond redemption with ground water acquifers (layers of rock or soil able to hold or transmit much water) having been rendered permanently depleted due to inadequate recharge.

The full potential of agriculture for growth can be exploited only if the available water resources for cropproduction and the water from the erratic and evenly distributed

rainfall is put to effective use. The tragedy with our agricultural production had been that we misutilised our ground water potential and ignored rainfed farming.

Rainfed farming has a distinct place in the Indian agriculture, occupying 67 per cent of the cultivated area, contributing 44 per cent of the foodgrains and supporting 40 per cent of population. But still it is not a priority area of our agricultural research. Currently, irrigated areas produce an average of 2 tonnes of foodgrains per hectare. The average productivity in rainfed area is only 0.7 to 0.8 tonne per hectare.

Even after realising the complete irrigation potential of the country, 50 per cent of the cultivated area will continue to depend on the rain god.

Our farmers prefer floor irrigation in agriculture. The excess irrigation water stands on the soil surface keeping the soil saturated for a long time. In this method, more than 50 to 70 per cent of irrigation water is lost due to evaporation, transpiration and by other means, hardly 30 to 50 per cent of water is consumed by the crop. The water crisis in the country, thus is inevitable unless micro-irrigation— the most efficient method of water utilisation for crop growth as practised in Israel — is made compulsory.

— The Tribune, Chandigarh; May 7, 2001.

PULSES CULTIVATION NEEDS TO BE ENCOURAGED

By Suraj Bhan Dahiya

Pulses from an integral part of the vegetarian diet in the Indian subcontinent. Besides, being a rich source of protein they maintain soil fertility through biological nitrogen fixation by bacteria prevalent in their root nodules and thus play a vital role in furthering sustainable agriculture.

It is sad that during the last decade there has been a shift from pulses area to wheat or paddy or even vegetable crops. Pulses have secondary status in the farming system, perhaps because of the prevalent notions like (a) cereals are the staple food; (b) pulses are not important cash crops; (c) higher risk and hence low stability of production of pulses; (d) higher losses in storage; (e) higher fluctuating market and (f) less responsive to inputs or even irrigation. Farmers, thus, grow pulses on marginal and sub-mar-ginal lands mainly for their own needs. More than 78 per cent of the area under pulses is still rained and therefore, production has shown very little rise.

The total area under pulses in India remained virtually stagnant (22 to 24 million hectares) with almost stable production of 12 to 14 million tonnes over the past four decades. The per capital availability of pulses has declined from 64 gm per day (1951-56) to less than 40 gm now as against the World Health Orgainisation's recommendation of 80 gm per day.

In the eighties the production of pulses stagnated or varied from 10 to 13 metric tonnes. Our target for 1984-85 in terms of production was 14.5 metric tonnes. Against this background, it is not encouragaing to note the target set for the terminal year of the Ninth Plan i.e. 2001-02 is just 16.5 metric tonnes after a gap of 17 years. Even during 1998-99, generally considered the best year in the decade, the production was 14.91 metric tonnes.

The working group on demand and supply projections for the Ninth Plan constituted by the Planning Commission had estimated the production requirement of

pulses at 15.3 metric tonnes in 1996-97 and 17.2 metric tonnes in 2001-02 as per the behavioristic approach of gross domestic production at the growth rate of 6 per cent. But we are nowhere near these targets.

India has witnessed Green Revolution resulting in surplus rice and wheat production. However, it has failed to make any headway in the production of pulses, with storage looming year after year. It is estimated that the country's population will touch nearly 1350 millions by 2020 AD. The country would then need a minimum of 30.3 metric tonnes of pulses. Let us analyse whether this target is achievable or not ?

The most widely known grain pulses are gram and pigeon pea. Kharif pulses (pigeon pea and others) account for 41 per cent of the area and 30 per cent production, the rest being occupied by rabi pulses. Gram accounts for the bulk area (35 per cent) and production (46 per cent) among all pulses. Our national average yield is low at the level of 550 to 650 kg per hectare against the potential yield of 1500 to 3000 kg. While talking or remedial measures we should bear in mind a direct link between our analysis of the situation and action to be taken.

The present infrastructure in terms of trained manpower for biotechnological researches and other scientific manpower to carry out pulses improvement programme and achieve the target of pulses productivities, is woefully inadequate. During 1993, the Government of India upgraded the Directorate of Pulses Ressearch to the Indian Institute of Pulses Research and established three coordinated projects, but the crop wise responsibilities to carry out research at various centres could not be assigned till some time back.

After all, it is the farmers who decided what to grow and in how much area and his decision is mainly based on three parameters — cost of production, the return from his labour and investment and risk involved. In this context, assurance of remunerative marketing holds the key to the decision making of the poor farmers. But bulk of the farmers whose land holdings are less than two hectares seldom get encouragement to cultivate pulses. There is good scope for expansion of area under pulses in various cropping patterns where production can be increased both by horizontal and vertical expansions. With the new technology developed, at least 12.4 million hectares can be added which will help in increasing pulses production by 5 to 6 million tonnes.

Under the National Pulses Development Project, the necessary chages have been incorporated during the Ninth Plan so as to make the various schemes (storage, milling, processing, marketing and finance) more effective to increase the production and to meet the domestic requirement. Financial assistance under the project will be provided on various critical inputs like production and distribution of seed, distribution of mini kits, improved farm implements, sprinklers sets, rhizobium culture etc. Pulses are also covered under the minimum support price (MSP) operations. A pulse policy is in the pipeline.

— **The Tribune, Chandigarh; July 23, 2001.**

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WHY TO DEPEND ON IMPORTED OILSEEDS ?

By Suraj Bhan Dahiya

India formulated an intergrated policy on ollseeds for self-suf-ficiency under "technology mission on oilseeds" in 1986. From a mere 11 million tonnes during 1986-87, the country attained an all-time record oilseed production of 25 million tonnes in 1996-97. It ushered in an era of yellow revolution. The mission later slowed down and oilseed prodution dropped to 24.73 million tonnes in 1998-99 and further to 18.6 million tonnes during the current year, and so the availability of domestic edible oil now is only 5.8 million tonnes. Edible oil imports have sharply increased over the decade as output failed to keep up with the burgeoning consumption.

Every year the demand for edible oil seems to be climbing up by 5 to 6 per cent. As a result, the total consumption of edible oil is expected at between 17.4 and 20.7 million tonnes by 2010. India's imports were expected to rise to 5.15 million tonnes in 2000-2001 from 4.39 million tonnes in 1998-99 when India overtook China as the world's biggest importer.

Since 1950-51, the area under oilseeds, production and productivity has increased nearly 2.5 times, 5 times and two times, respectively. During the last decade soyabean registered the highest compound growth rate of production followed by castor, sunflower and rapesed. Ground nut, rapeased-mustard and soy-abean possess major share, both in terms of area (74 per cent) and production (84 per cent) of oilseeds in the Country. As far as productivity is concerned, caster tops the list (1192 kg/ha) followed by groundnut (1155kg/ha), rapeseed-mustard (1013 kg/ha) and soyabean (995 kg/ha).

The actual area increase came where the oilseed crops were superior options to traditional crops in crop combination. Similarly, the farmers of the water starved regions of North Gujarat and Rajasthan chose rapeseed over wheat to get better returns from the available water. Farmers responded enthusiastically when they were provided economic incentives under technology mission. They adopted new technological options and practices which brought them big returns.

However, between 1993 and 1997, there has been only a marginal increase in vegetable oil prices in the domestic market. With the result that oilseed production nearly stagnated. Farmers never accepted a combination of low prices and high risks. In some regions, a shift from oilseeds was also noticed. This was a great setback to the technology mission on oilseeds.

The vegetable oilseeds are cultivated in 14 states, of which Madhya Pradesh, Rajasthan, Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Uttar Pradesh and Tamil Nadu account for nearly 90 per cent of the oilseeds area and production. Madhya Pradesh has the highest area and production followed by Rajasthan, Andhra Pradesh and Gujarat, Among different oilseeds, rapeseed-mustard happens to be major oilseed crop in seven states; groundnut in four states, soyabean, sesamum and niger in one state each.

The government is seized of the issues arising out of large imports of edible oils and poor output of oilseeds. Looking at the present consumption level, an additional consumption requirement would be about five to six lakh tonnes of oils per annum. And if India wants to freeze the level of imports at the existing 4.5 million tonnes and to stop additional imports in the future, it should produce some to five to six lakh tonnes of additional oil each year.

Under the present circumstances, it does not seem to be achievable. And India will continue to depend on oil imports over the next five to 10 years.

However, the government is finding out ways to boost domestic output of oilseeds. The government, in order to motivate to switch over from grains to oilseeds, is thinking of a proposal to pay farmers if they plant oilseeds instead of grains.

To further redue the gap between demand and local supply of edible oil the government has to explore the supplementary sources contributing about 16 per cent of vegetable oil consumption in the country.

Oil palm is another potential source of edible oil expected to contribute significantly towards meeting the growing edible oil demand. At present, oil palm is cultivated on an area of eight lakh hectares agaisnt the potential area of 0.8 million hectares spread over 11 states. With a productivity of nearly four tonnes per hectare, oil palm can contribute about one million tonnes of edible oil in the near future, accounting for about 10 per cent of the demand.

With a view to encouraging local farmers to go in for more oilseeds cultivation and protect their interests, the Union Finance Ministry hiked the import duty on edible oils in the current budget to 75 per cent for crude palm oil and 92.4 per cent on palmolein as against 45 per cent on soya oil.

The duty was effective from March, 2001, which resulted in vegetable oils import declining to 2.84 lakh tonnes in March from 3.74 lakh tonnes in February and 3.07 lakh tonnes in March last year.

What is surprising is that the share of plam oil product's import increased substantially to 86 per cent from 69 per cent in February despite substiontial increase in import duty.

The overal effect, however, proved to be shortlived and vegetable oil import in April jumped to 3.99 lakh tonnes recording 33 per cent increase on 2.98 lakh tonnes same time last year. Malaysia and Indonesia both the main producers of palm products, have resented in the large duty difference between soya and palm products and have sought level playing field. Now the government is in a quandry. The opinions differ. The Agriculture Ministry feels that if the import duty is reduced now it can have adverse effect on the sowing for kharif.

The most significant question arises from the present oil economy scenario of the country. Will India rise to face the challenges and equip itself with global oil trade pressure?

Though Indian vagetable oil complex is at the crossroads, yet technology mission on oilseeds may stand to ease out the oil tension substantially. It should be further strengthened with the following aims :—

— Self-sufficiency in vegetable oils.

— Reduce instability in the production of oilseeds.

— Massive savings of foreign exchange.

— Clearoil policy management.

— Smooth management of consequences of high prices.

— Protection of farmers against imports.

— Movement towards modernisation of the oilseeds sector. For it, oilseed reserch and development, institutions should be financed liberally to infuse newzeal in technology mission.

— **The Tribune, Chandigarh; August 31, 2001.**

INDIAN AGRICULTURE IN CRISIS

By Suraj Bhan Dahiya

The first generation of economic reforms in India were concentrated to the industrial economy and reforms in the agricultural sector were neglected. Consequently, the agriculture faired poorly through the 90s — growing at 3.3 per cent from 1992-93 to 2000-2001, while the industry's average growth remained at 6.5 per cent.

Impact of globalisation apart, the fall in agricultural production has raised serious doubt as to the sector's ability to reach the target of 230 million tonnes which will be required to feed the population of over one billion in this milliennium. Deceleration in foodgrains growth is sure to multiply the number of empty stomach in the coming years. The situation, therefore, is turning grim. The growth rate of crop production is losing track of population growth.

"At this stage if the Indian agriculture does not become efficient it will be taken over by the foreign agriculture", cautions father of the Green Revolution M.S. Swaminathan. "For a nation like India, agriculture is a livelihood security. One requires synergy between the public policies and the technology. This unfortunately has become negligible, "he laments. At present, agriculture in India is the largest private sector. It contributes 26 per cent of the country's gross domestic product (GDP) as against the industry's 22 per cent. Still investment in agriculture continues to decline year after year.

The sector produces 51 major crops, provides raw material to the country's agro-based industries and fetches nearly one sixth of the total export earnings of the country. But when the food processing industry is picking up, the Indian markets are loaded with foreign processed food products. The World Trade Organisation's (WTO) regime, therefore, has started attacking on our basic occupation.

Till recently, economists had almost exclusivley directed their interest in analysing the impact of globalisation on the country's industrial sector. But now the agricultural sector has become their main concern.

The gains to India from the trade liberalisation process in agriculture are practically zero, hopes of a fair and market-ori-ented agricultural trading system have been belied, and competitiveness of export from developing countries has been eroded. The agreement on agriculture had commitments on market access, domestic support and export subsidies, the aim being to correct distortions. In post Uruguay Round, India had to cut its agricultural subsides by 30 per cent and trade restrictions on 714 items out of which 482 were related to agriculture and peasantry were withdrawn.

The developed countries, however, have manipulated subsidy reduction commitments to increase support to their own farmers. In the USA, subsidy to a mere 90,000 farmers is said to have increased by 700 times since 1996. In developed nations, well before the Urguay Round, the farmers subsides had been doubled— from $ 88 billion to 177 billion. Today, in European countries domestic support and export subsidies to farmers amount to 56 per cent of the cost of production, while in the USA they account for 28.7 per cent. But these subsidies do not fall in the WTO's restrictions. Such kind of export subsidies, however, are not provided in India. And in such a situation India cannot compete in the world agricultural trade.

According to one estimate, the food processing industry in India is one of the largest exterprise, both in terms of production and consumption and in value terms it is estimated at around $ 70 billion. However, it is wasting as much as $ 15 billion worth of food items every year because the processing industry is under developed.

Food processing holds the key to prevent wastage of food items. Massive investments are called for to save food through processing. The present level of processing is limited to 2 per cent as against 60 to 80 per cent. From 2 per cent to 10 per cent in 10 years, this will need an investment of Rs 1.4 lakh crore. It seems that we are not prepared for the requisite investment to bring India at par with the developed countries in food procesing industry.

Since the peasants are basically the primary producers and do not have the wherewithal to process, the benefits of value added to the product only accrues to the manufactures.

For example, the Indian farmer is forced for distress sale, now just throwing his wheat at any price between Rs 450 and Rs 600 per quintal. But Britania Biscuits Factory is selling its biscuits at Rs 11,000 to Rs 15,000 per quintal.

This is one of the basic dichotomy in our agricultural marketing. Thus, India has to resist the penetration of multinationals in its agricultural marketing. It has to treed carefully on the WTO farm negotiations. We have time till 2005 to strengthen and insulate our agriculture against the WTO onslaught.

— The Tribune, Chandigarh; October 22, 2001

LAUNCHING FARMER ENTREPRENEURS ASSOCIATION

By Suraj Bhan Dahiya

The major reason behind India's poor progress in poverty alleviation is the coming down only marginally the share of agriculture in working population, from 71 per cent in 1951 to about 64 percent now. But its share in the gross domestic product (GDP) has dropped from 56 per cent to 25 cent. In other words, 25 per cent of the GDP has to take care of 64 per cent of India's labour which, in turn, shows the rising income inequality.

Agriculture is basically a private unorganised enterprise. It is the hands of some 125 million farming families of which 75 per cent are marginal farmers holding one hectare or less land. Most of these farmers continue to follow the rice-wheat crop rotation. With the world prices for wheat and rice having declined substanitally recently, the odds are pitted heavily against these farmers. Cashing in on the difference in domestic and international prices of these commodities, multinationals for their gains are now increasingly resorting to exports of wheat and rice. The result is that the burden on marginal farmers is becoming increasingly unbearable.

Farmers too understand profit but they fail miserably when they come for marketing their produce. The prices offerd for products grown by the subsistence farmers have been far too depressed in the form of minimum support price leaving their agony of distress sale. This has resulted in a very dangerous sitution for India. Don't be surprised, there is every likelihood that the farmers may not go in for diversification in the near future as they have a bitter experience in growing of potatio, onion, etc. Indian policy makers, therefore, need to learn some lessons from the past experiences. The global role of India can only be best served by a focus on agriculture and agroprocessing. Instead of focusing all its attention on the individual sector, the government should also take steps to integrate the country's farm sector with global agriculture. Our policy planners would have to think very seriously how well India integrates her agriculture with world markets. Globalisation can become a real threat if the farmers are left to fend themselves against global food majors. The time has come for some major modifications in our agricultural strategy. Before restricting to wheat and rice areas offer alternate crops, we must also study our future requirements. The Washington based International Food Policy Research Institute in its paper on "Prospects for India's supply and demand 2020" projected that cereal gap would be about 115 to 142 million tonnes if the country becomes a "tiger economy" with 6 per cent growth in per capita income each year. Even if the Indian economy slows down to mere historical rates of growth, the cereal gap could grow to as much as 25 million tonnes by 2020 the report cautioned.

So ensuring self-sufficiency in foodgrains, the country has to include agriculture. We see an opportunity in the new world order into an opening for our farmers. What is needed for agriculture to receive a boost is to replicate what was done for the information technology sector for everyone to come together, including government, scientists, mangers and farmers. This can be achieved through the Farmer Entrepreneurs Association (FEA) like FICCI (Federation of Inida Chambers of Commerce ans Industry). To begin with, we want to make entrepreneurs out of farmers. Under this organisation, the farmer not only merely grows but also sells his produce at the farm gate like industrial production. The FEA also aims at teaching him to do some basic value addition at his level, which will increase the shelf life of his produce which, in turn, will fetch him a better price for his goods. This will work in two ways for the country— as a

producer the farmer will meet the creal requirement of his countrymen and as an entrepreneur, he will compete in the world market.

We realise that marketing is a major hurdle for the farmer. Like the FICCI, he has no access to finance or to that equally critical component marketing enterprise. We must invlove banks and other financial institutions to help the FEA in meeting its financial requirements. On the marketing front, the FEA should tie up with institute of management of the country so that the farmers may pick up proven successful agricultural management quickly. In fact the Indian Institute of Managment, Ahmedabad, has started anextensive course on agricultural management to pool the trained talent which will do the extension work of taking it from the laboratory to the farmers field. Some agricultural universities should also lend support in this venture. A policy adviser at the Institute of Personnel and Development, New Delhi, says. "Its highly unlikely that farmers will persuade others to manage their careers if they are not handling their own. If you are searching skill for agricultural management then the children of farmers should be trained in farm management." A well-known agricultural expert, Mr Ahok Gulati, who is now in the Prime Minister's new advisory teams has long been advocating complete freeing of agricultural markets and has carried out empirical studies to show its advantage. Mr Gulati says that going rural, agri-business will flourish for the rescue of the troubled national economy.

— The Tribune, Chandigarh; May 27, 2002.

ACHIEVING EMPLOYMENT TARGET THROUGH AGRICULTURE SECTOR

By Suraj Bhan Dahiya

The Prime Minister's special group on the creation of 50 million jobs during the 10th Five-Year Plan period has established that nearly 20 million job opportunities should come from specife employment generation programme and an additional 30 million jobs from growth buoyancy.

Trade, hotel and restaurants are expected to generate the highest number of jobs — 11.23 million — followed by agriculture (9.47 million jobs). It is expected that by the terminal year of the 10th Five-year Plan (2006-07), 19 per cent of the employed will be working in the primary sector, 30 per cent in the secondary sector and 52 per cent in the services sector. The additional job opportunities to be created in agriculture during the 10th Plan would be 0.41 million growth-based and 9.06 programme-based.

The agriculture sector has a high job potential if adequate policy changes are introduced and sufficient funds are pumped into this resource-starved sector However, the Paliamentary Standing Committee on Agriculture and Co-oper-ation in its 30th report has observed that continuously for years together, less than 50 per cent of the amount (demanded) is being allocated by the Planning Commission i.e. less than half the requirement of the fund is being met. then how does the government propose to double the agriculture production in 10 years as envisaged with 50 per cent fund required to undertake schemes to increase agricultural production?

The Department of Agriculture had sought an outlay of Rs 18,253.81 crore for the Ninth Five-Year Plan, but was provided Rs 7,813,69 crore which was only 43 per cent of the demand. Again during the 10th Plan as against a demand of Rs 25,000 crore,

the sector was given Rs 13,000 crore which was just 52.8 per cent of the demand. Therefore, the target of 10 million jobs a year seems to be a distant dream.

The National Council of Applied Economic Research has projected agriculture growth of just 3.8 per cent during the year 2001-2002 in contrast an estimated farm sector growth of 5.7 per cent on which the government pins its hope of economic revival. Under growth is attributed to the fact that the incremental income generated in agriculture by and large goes to the non-farm sector, Nearly 58 per cent of the incremental income is passed on the rest of the economy and this has been proved in a recent study conducted by Tamil Nadu Agricultural University in collaboration with the International Food Policy Research Institute, Washington. This suggests that even from the overall growth point of view of the country it is necessary to lay prime emphasis on agriculture and allied activities not only for its low capital output ratio but also its contribution to the rest of the economy and their ability to generation employment.

The Finance Minister says that if we want to target 7 to 8 per cent growth, we have to give a lot of emphasis on feedom of agriculture. Our research shows that 3 per cent growth in agriculture would translate into 2.6 per cent growth for the manufacturing sector and 1.7 per cent for the overall gross domestic product. Infact, we need a new revolution — the herbal revolution to give freedom to farmers. Farmers should be involved in export business. They must also be encouraged to start their own agro-processing units.

Herbal revolution is basically an agricultural interprise. India is ideally poised to lead the world in herbal business. This is the century of the digital, herbal and spiritual fields. All three are the areas where India has an enviable place in the world. The herbal industry is worth $61 billion today and would grow to $5 trillion by the year 2020. And it is a fantastic opportunity. If not India, which nation is ideally suited to bringing in the herbal revolution?

Raising the growth target to 10 per cent is not feasible because even the 8 per cent growth target is under heavy financial constraint. Therefore, the only alternative left to solve the unemployment problem is to adopt labour intensive patterns of agricultural production so that within a feasible growth rate, the employment targets can be achieved.

— **The Tribune, Chandigarh; June 24, 2002.**

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RURAL POVERTY INTRACTABLE

By Suraj Bhan Dahiya

Extending benefits to India's nearly 6 lakh villages and improving the living standards of rural people, particularly of those below the poverty line, have been avowed goals of India's planning. Despite five decades of planning, there is still a long way to go in achieving these goals.

For a household of five members, the poverty line is represented by an annual income of Rs. 11,060(1991-92 prices). Per capita it comes out to Rs. 3,704 at current

prices. It is an accepted fact that the major determinants of per-capita rural income are gross croppes area per person, and per-hectare income generated. The gross cropped area per hectare in India is only 0.30 hectare in rural areas, indicating that there is a heavy population pressure.

According to a study conducted by the Economics and Statistics Organisation, Haryana, the gross value from agriculture per hectare at current prices in Haryana in 2000 — 01 was Rs 41,323. Using this statistics the income generated, i.e., the net value added per hectare was found to be Rs 2,153 only.

The agricultural income per rural person is estimated at Rs 646 if the gross value from agriculture per hectare from Haryana is taken (0.30 x Rs 2153). The availability of the gross cropped area per rural person will decrease due to fast population growth. The average size of the rural house hold is reckoned at 5.6. The per capita consumption expendi ture of these households is estimated at Rs. 1,560 just for survival. Thus the annual expenditure each of these households comes out to Rs 8,936, while the total farming income would be just Rs 3673 (Rs 646 x 5.6). This income falls well short of the minimum level required to keep the body and soul together, leave alone other necessities of life like medical care and education.

Traversing to the pathological nature of the agrarian structure, an analysis of the number of operational holidings by major size classes of farms — mar ginal farmers having less than I hectare, small farmers 1 to 2 hectares and semi medium farmers with 4 to 10 hectares and large farmers with 10 hectares and above — reveals that nearly 75 per cent of the holdings fall within 2 hectares, having area of hardly 26 per cent. These rural small and marginal households numbering 78.9 million having a total of 441.84 million people can be considered as hardcore rural poor.

On an average, the suggested consumption for a household would be Rs 11,537 now. This leads to the conclusion that the consumption level of small farmers is far below the nutritional requirements. The poverty estimation by the planning commission thus appears to be rather misleading. Not long ago, Kheti Virasat, Delhi, a voluntary organisation, had conducted a survey in three villages of Punjab. According to the study, in Mandikhurd village, with a population of 1400 and average land holding of 1 to 5 acres, the debt per farmer varied from Rs 6 lakh to 10 lakh. In Ramanvas village-population 1970, average holding 4 acres-the average debt per farmer was Rs 4 lakh. In Harkishanpura village of 900 people and 12 acres average holding the debt per head was between Rs 4 and 6 lakh.

First the farmers mortgaged their lands to raise loans from private lenders. Unable to repay, they sold off their lands. In Mandikhurd. Ramanvas and Harkishanpura villages farmers sold 300, 100 and 300 acres, respectively, to outsiders to overcome their debts, but they failed. A few farmers were forced to embrace death when they failed to attain relief even after selling their lands. When agriculture fails to meet the basic needs of even farmers in Punjab, a state with more than 80 per cent of the total area under assured irrigation, the fate of those having dry and parched lands or rain-fed lands in other parts of the country can well be imagined.

If one looks at the features of Indian farming, heavy concentration of area under food crops will be noticed. Agricultural prices, especially of food grains, are depressed

not by market price, but by price controls and other measures. The agricultural price policy ignores the cost element and distributive justice and also the long term adverse effect on capital and technology transfers to the rural economy.

Reasonable return to farm products should be provided during the initial stage of development and should always be kept slightly higher than the non-farm products. This argument stems from the fact that the present emphasis is on employment, rural development, meeting the basic needs and income distribution. In recent years certain developing countries tried to keep agricultural prices low. They experienced slow growth, both in agricultural and overall production. The price policy now pursued by the industrial countries is in favour of agriculture rather than industry-stimulated farm production to a significant extent. The basic tragedy in our economic system is that agricultural prices are kept down and the prices of manufactured products at a fairly higher level.

The peasants are basically the primary producers and do not have the wherewithal to process. The benefits of value addition acrue only to the manufacturers. This is a major dichotomy in our economic system — a mere processor becomes wealthy while the basic producer struggles to have a decent living.

There is now a strong plea for diversification of crops to improve the economic condition of small farmers. It will not redress peasants' miseries till the farm trade and agro-pro-cessing business goes in the hands of peasantry.

— The Tribune, Chandigarh; July 7, 2003.

NEW STRATEGY FOR RURAL HARYANA PROSPERITY

By Suraj Bhan Dahiya

Agriculture is the science of growing crops, raising livestock and improving the quality and quantity of farm products. The agriculture profession in the state is facing the serious problem of unemployment. Therefore, the state requires new strategy in the agricultural sector.

Agriculture offers numerous career opportunities in farming, horticulture, floriculture, cultivating rare medicinal herbs, mushrooms and hybrid seeds, dairy, poultry and fish farming, commercial forestry to food processing and agri-exports, all of which are lucrative options. With the application of scientific research and technology the output and profitability of this sector should be increased so that economic conditions of farmers in the state are improved. From soil, water and pest management to post-harvest management, there is a growing demand for qualified professionals at all levels. These opportunities should be made available to young Haryanvi farmers. Infact, every inch of agricultural land in Haryana is a commercial venture. The agriculture entrepreneurial skill of Haryanvi peasantry should be exploited which may provide million of jobs to the unemployed youths of the state. The kisan call centers manned by agriculture experts in eight states to provide answers and advice to farmers who dial a toll free number being launched by the Prime Minister hold an interesting potential. This is first step towards

agricultural youth's involvement in rural prosperity. This has been well elaborated in my paper 'New Vision on Haryana.'. I strongly emphasise that Haryanvi farmers should capture vast bazaar of the National Capital.

Since independence, we have created a number of development functionaries at the Central, State, District and Block levels, but unfortunately they have not made any significant impact on the rural society because of a variety factors. For rural prosperity in Haryana, entire administrative structure now will have to undergo radical charges from elite IAS down to the block level officers if efforts of development planning have to bear any fruit. It is proposed that at the block level it would be advantageous to appoint Rural Development Manager of rural background incharge of development centers. He will have to work directly under Chief Executive Officer Block-an IAS Officer and may look after 10 to 15 thousand target population. The experience gained by the Chinese in this direction is worth noting in context of rural development of Haryana. It will have little burden of exchequer. In fact, sub-tahsil, tahsil and sub-division do not fit this dynamic administrative model. Originally, the block establishment was conceived as a people's organization, but when the generalist and technical cadre officials are posted to a block with career oriented loyalists to the respective departmental heads, they could not made corrdinated efforts for block development. Development is a full time activity and if professional cadres and to be built up the State Administrative structure will have to be properly reoriented beginning from the village level workers to the Secretariate. Thus management of rural development will have to be thought of as an integrated approach.

National Bureau of Animal Genetic Resources, Karnal

National Bureau of Animal Genetic Resources (NBAGR) and National Institute of Animal Genetics (NIAG) were established on 21st September, 1984 in the campus of Southern Regional Station of National DairyResearch Institute, Bangalore. The Bureau and the Institute were shifted to Karnal in July, 1985 and temporarily housed in NDRI campus and occupied their own campus at Makrampur, Karnal in 1994. The National Institute of Animal Genetics and the Bureau were merged in 1995 to function as a single unit National Bureau of Animal Genetics Resources.

The diversity in animal genetics resources of India exists as a vast array of breeds and livestock population that have evolved and adapted over centuries to varied climatic conditions. India as one of the world's mega biodiversity center harbour a broad spectrum of native breeds of Cattle (30), Buffalo (10), Sheep (42), Goats (20), Camel (9), Equines (6), Poultry (18) besides pigs, yak, Mithun, Ducks, Quails and Geese, Indiscriminate crossbreeding, extensive system of rearing and substitution with exotic germplasm have lead to the genetic dilution of local. This has resulted in the erosion of native germplasm.

Objectives

1. To conduct systematic surveys to characterize, evaluate and catalogue farm livestock and poultry genetic resources and to establish their National Data Base.
2. To design methodologies for ex situ conservation and in situ management and optimal utilization of farm animal genetic resources.
3. To undertake studies on genetic characterization using modern techniques of molecular biology such as RFLP analysis, DNA fingerprinting, molecular cytogenetics and immunogenetics etc.
4. To conduct training programmes as related to evaluation, characterization and utilization of animal genetic resources.

RESEARCH ACHIEVEMENTS

Breed Discriptors for characterization for ANGR

Breed descriptor formats for cattle, buffalo, sheep, goat and poultry species have been developed and distributed to various organizations for uniform characterization of Animal Genetic Resources of the Country.

Date Base Management

An information system (AGRI-IS) has been evolved for storing and retrieval of information on animal genetic resources of the country. Data Bank on livestock census, livestock literature, germplasm resources and breed characteristics has been developed.

Phenotypic Characterization

The Phenotypic Characterization has been accomplished in 23 breeds of Cattle, Buffalo-7, Sheep-17, Goad-14, Poultry-7, Horses-3, Camel-2, and one breed of Mithun.

Molecular Genetic Characterization

The Molecular Genetic Characterization of various populations/breeds has been carried out using microsatelite markers to study the genetic structure and establishing relationships among them in various livestock species viz., Cattle-13, Buffalo-4, Sheep-12, Goat-9, Poultry-7, Horses-3, Pig-3 and Camel-1.

Cytogenetic Characterization

The karyotypic features of all the species of domestic livestock i.e. Cattle, buffalo, Sheep, Goat, Equine, Camel, Pig and Poultry has been covered. Cytogenetic screening servies for breeding bulls are being provided to various agencies throughout the country.

Animal Genetic Resource Evaluation

- Evaluation of interleukins in indigenous cattle breeds to study disease resistance.
- A new mutation in exon 2 of GDF-9B was discovered in indigenous Garole Sheep.

- Myostatin, a negative regulator of skeletal muscle mass, causing muscular hypertrophy was characterized in indigenous cattle, buffaloes and chicken.
- ACNDA Library from lactating buffalo mammary glands has been created as a resource for characterization of EST/genes association with milk production.

Conservation of Animal Genetic Resources

- Ex-situ conservation programme on following livestock breeds has been undertaken by NBAGR

Species	**Breeds**
Cattle	Punganur, Bagori, Rathi, Kangayam, Krishan Valley, Ponwar, Kherigarh
Buffalo	Bhadawari, Pandharpuri, Tarai, Jaffarabadi
Sheep	Garole, Bhakarwal, Pugal
Goat	Black Gengal, Chegu
Camel	Jaisalmeri

- In-situ conservation programme on following livestock breeds has been undertaken by NBAGR

Species	**Breeds**
Cattle	Tharparkar
Buffalo	Toda
Sheep	Nilgiri, Chokla, Mandya, Magra
Goat	Surti, Beetal
Horse	Spiti

- **Somatic Cell Bank** have been established to conserve the breeds of livestock showing sharp decline in population (Bhadawari Buffao and Pugal Sheep).
- **DNA Bank** for livestock breeds has been established for posterity.
- **National Gene Bank** at NBAGR : Cryopreserved semen available for 7 breeds of cattle, 4 breeds of buffalo, 2 breeds of goat and one breed each for sheep and camel.

Awareness Programmes on Animal Genetic Resources

The Bureau has been undertaking Brain Storming Sessions for creating awareness among stakeholders of various States including policy makers, field workers and farmers. Till now Awareness Programmes have been conducted for

the States of Uttarpradesh, Orissa, Karnataka, Maharashtra, Rajasthan, West Bengal and Nagaland.

Human Resource Development

NBAGR has been regularly conducting training programmes on various aspects of animal genetic resources characterization, evaluation and conservation. Specific modules have been prepared for policy planners and field veterinarians for ANGR characterization. Also training on Biotechnology tools are being imparted to Researchers, Teachers, Scholars and Students.

PUBLICATIONS

Books-005, Research Bulletins-015, Research Papers-350 and Gene Bank Accession-088

TECHNOLOGY DEVELOPED

- Cytodiagnostic sex chromatin test for early prediction of reproductive performance in farm animals.
- Soamtic cell technology for conservation of animal genetic resources.
- Information system on animal genetic resources of India (AGRI-IS) – a software package available on CD with animal genetic resource information of the country.
- Standardized indirect and direct test for fecundity gene in sheep and goats.

SCIENTIFIC INFRASTRUCTURE

Laboratores	Acticities
Central Instrument Facilities	Provides basic facilities for DNA sequencing & molecular genotyping
Core Laboratory	Molecular Characterization and genetic relationship of different livestock species under All India Network Project.
Functional Genomics Laboratory	Gene expression profiling of economically important traits
Molecular Genetics Laboratory	Biodiversity and genome analysis of different livestock species.
Animal Cloning Laboratory	Nuclear transfer and animal cloning research
Gene Mapping Laboratory	Localization and mapping of genes in livestock species
Cytogenetic Laboratories	Karyotyping for screening of cytogenetical abnormalities in breeding bulls
Laboratory	Immunogenetic studies on indigenous livestock breeds
Data Bank	Inventorization of livestock census, literature, germplasm resources and breed characteristics

Gene Bank	Semen cryopreservation of indigenous livestock breeds for posterity
Somatic Cell Bank	Cryopreservation of somatic cells for futre animal cloning
DNA Bank	Repository of molecular voucher specimen of livestock breeds