

# Recent Trends in Agricultural Production

J.S. BALI

President of the Soil Con. Soc. India;  
E 353 Nirman Vihar, New Delhi-110 092.

***Abstract :** The agricultural production has gradually been improved during the last four decades, and reached to a level of 138.4 m tonnes in the year 1987-88. The beneficial effects of this rise are seriously hampered, because of population growth and its rising expectations. The total land availability per capita is being continuously degraded. Both men and animals are growing beyond the carrying capacity of land resource. The land degradation and unscrupulous deforestation are other serious problems. Thus, both our food and environmental security are under jeopardy. The adoption of watershed development and management strategy with people's participation may provide an effective tool to tide over the challenging problems. The Gandhian model of "Watershed self-sufficiency" operated by a separate department of watershed management is suggested. It should encompass the multidisciplinary services of agriculture, forestry, horticulture, animal husbandry and rural development in a package. The individual disciplines as exist at present should confine themselves to reserarch, education, training and management in special areas. Unless such steps are taken all the talks of selfreliance and environmental protection would be futile.*

Indian agriculture is both a story of phenomenal success and dismal failure. The foreign advisors, in the seventies, had predicted devastating famines in India in the eighties; they were proved wrong. The failure is apparent in the fact that per capita nutrition level of the people, especially of the poor, has not materially improved. A bigger failure is that the landstock, the basis of production, has degraded over the last 40 years. The national agricultural enterprise of the future would be required to feed the rising population, human and animal, from the shrinking

land resource base. A still bigger source of concern is the degradation of the agricultural environments due to wanton destruction of the forests, diminishing agricultural profitability, and deterioration of law and order in the country side. The current policy of land reforms has further aided the process of diminution and fragmentation of land holdings. A real damage has been done by the scientists who proclaimed that the improved agricultural technology was size-neutral. A deeper insight into the socio-economic conditions of rural India would have revealed that a small

holding, especially in the 100 m ha of the rainfed farming sector, is more of a liability than an asset. A landless labour in the same village is often happier than a small farmer as he is free to seek remunerative employment rather than waste his energy in tilling marginal holdings for doubtful returns.

### POPULATION AND NEEDS

The foodgrains production increased from 50.8 m tonnes in 1950-51 to 138.4 m tonnes in 1987-88 with a rise of 172 per cent. In the same period, population rose from 361.1 m to 796.6 m, a rise of 121 per cent. The per capita production of foodgrains increased from 141 kg in 1950-51 to 174 kg in 1987-88 i.e. rise of only 13 kg in a year (Anon, 1988, 1989 and 1990). This amounts to just a kilogramme of additional foodgrains per month after 37 years. With the prevailing maldistribution of essential commodities and greatly reduced purchasing power, one-third of the country's population living below the poverty line, would thus be getting today even less than the previous generation.

At the compound growth rate of 2 per cent, the population would become 1000 m by the year 2000, and as much as 1256 m by 2010. The present calories available to an Indian are only 2204 per day compared to 2622 in South America, 3313 in Egypt, 3611 in Libya and 3642 in U.S.A. (Anon, 1990a). Not only our population is rising but our people's expectations are also rising. To have a healthy nation, at least 50 per cent rise in the status of nutrition would have to be

considered as the national need. To supply 3306 calories per day, the foodgrains should have been produced at the rate of 255 m tonnes in 1989, considering the same relative proportions between foodgrains and other food items. This would provide 314 kg of foodgrains per capita per annum. On this criterion, by the year 2010, the country would need 394 m tonnes of food grains to feed 1256 m population. Other food items like milk, meat, fruit, tubers, sugar, tea, etc. would also have to be stepped up in similar proportions. The present complacency about population and food needs is not warranted by the facts, to say the least.

Of the 963 m of the future rural population, 727 m would be workers who would demand the 'right to work', considering the same proportions as prevailed in 1981. But if the rural population is to be decreased by migration to the existing cities, it would produce unheard of social tensions. Agricultural production, therefore does not only provide food but also rural employment. The children of the present villagers demand better type of employment and wages, comparable to the urban areas. Nonfulfilment of such aspirations is one of the basic causes of the present unrest in some of the States, although the apparent cause which triggers the commotion may be very different.

Animal population is also increasing and putting an unbearable burden on the scarce land resources. According to livestock census in 1982, the number of

TABLE 1. Population and foodgrains production

Particulars	Population and production				Compound rates of growth (% per annum)		
	1971	1981	1988	1989	1971-81	1981-88	1981-89
Population (m)	548.9	685.2	796.6	811.8	2.24	2.18	2.14
Foodgrain production (m tonnes)	108.4	129.6	140.4	170.3	1.80	1.15	3.47
Per capita Annual pro- duction (kg)	198.0	189.0	176.0	210.0	-0.47	-0.71	+1.06

livestock in the country was 419 m; the present population is likely to be well over 500 m. For each one of the useful cattle, India has 4 useless ones which yield only some cowdung for fuel. The grazing pressure on land is far greater than its carrying capacity. But in the dry, droughty rainfed lands of the country, it is the cow or the goat which becomes the wherewithal of survival of the poor. Animal husbandry's role in watershed management projects has so far been minimal. Unless special efforts are directed towards improvement in quality and reduction in number in respect of livestock, there is little hope for the improvement or even sustenance of soil fertility and preservation of the protective vegetation in the catchment areas. The crop residues which are eaten up in India by the cattle should really go back to the soil if productivity is to be improved.

On the basis of 2.6 tonnes of dry fodder requirements per animal unit annually, the fodder requirements of the

country would be well over 1000 m tonnes (AFC, 1988). The National Land Use Policy outline (*Anon, 1986*), estimates the requirements of the country by the year 2000 as follows: foodgrains-225 m tonnes; sugar and gur-30 m tonnes; tea-695 m kg; coffee 150 m kg; vegetable oil-10.2 m tonnes; cotton-17.2 m bales; inland fish-3.5 m tonnes and industrial wood-64.4 m cubic metres.

#### PRODUCTION TRENDS

From 1971 to 1981, the population increased at the annual compound rate of 2.24 per cent while the foodgrain production increased only by 1.18 per cent. Between 1981 and 1988, population grew at the rate of 2.18 per cent per annum while the foodgrain production was only by 1.15 per cent. Just one year later i.e. 1988-89, the foodgrains registered a figure of 170.25 m tonnes, making the whole picture look very bright. Considering the latest production figure, the production rate is 3.47 per cent against the population growth of 2.14 per cent between 1981 and 1989

(Table 1). These figures show the effect of weather on the rainfed area production which influences the total production figure significantly. Unless the kharif production be freed from the vagaries of weather, the nation cannot feel secure about its food supplies. Just as water storage is the answer to floods and droughts, foodgrains storage is the answer to fluctuating production. But the basic challenge is how to reduce the production uncertainties by increasing water supplies when monsoons start late, often with large dry spells or withdraw too early.

Between 1966-67 and 1988-89, foodgrains production in rabi increased from 25.34 to 73.83 m tonnes, while kharif lagged behind with only 3.13 per cent increase rate (from 48.9 to 96.4 m tonnes). Area also increased under rabi cultivation from 37.09 to 45.54 m ha (0.94 % growth annually) compared in kharif production area which increased from 78.21 to 82.8 m ha (0.26 %) in the same period. Rabi yields increased from 6.8 to 16.21 q/ha (137 % increase) and kharif from 6.25 to 11.65 q/ha (86 % increase).

Irrigation is also benefiting mostly the rabi crops. Overall, the increased crop production in rabi is attributed to high yielding varieties, irrigation (83.7 % increase between 1949-50 and 1986-87) and fertilizers use (from 65.6 thousand tonnes of NPK in 1951-52 to 11.035 m tonnes in 1988-89). These facts point out the need to give special attention to the rainfed areas where water harvesting, better varieties and integrated plant

nutritional programme comprising organic and inorganic manures need to be adopted.

Due to the introduction of high yielding varieties, the area under foodgrains registered an increase from 99.28 m ha in 1949-50 to 128.30 m ha in 1988-89 (29.2 % increase). This happened at the cost of area under pulses, oilseeds, culturable wasteland (producing fuelwood and fodder), and village common lands under pasture or woodlots. It created the shortages of pulses and oilseeds and of course, fodder and fuelwood leading to an encroachment on the regular forestland. For balanced production of food, fodder and fuelwood as well as for preserving the environment, there should be no more increase in the agricultural land, which is already 165.99 m ha or 54.4 per cent of the total reporting area in 1986-87.

Production trends and especially per capita production of different crops have been worked out in Table 2. the country has to register an increase of 50 per cent per capita in order to provide about 3000 calories per day to all. Judged against this criteria, the maximum shortfall is in small millets. Instead of 50 per cent increase, it has become less by 70 per cent. Therefore, a rise of 120 per cent would be required to achieve across-the-board increase of 50 per cent in food available. Small millet shortage hits the poorest of the poor, specially in the tribal areas of the country. The reasons are low profitability, dependence on the weather (almost completely), low capital, lack of

TABLE 2. Production trend of selected crops

Crops	Production						Increase (%)	
	1950-51		1970-71		1987-88		1950-51 to 1987-88	
	Total (MT)	Per capita (g)	Total (MT)	Per capita (g)	Total (MT)	Per capita (g)	Total	Per capita
Rice (shelled)	20.6	57.0	42.2	77.0	56.4	70.8	173	24
Wheat	6.5	18.0	23.8	43.4	45.1	56.6	594	214
Pulses	8.4	23.3	11.8	21.5	11.0	13.8	31	41
Oilseeds	5.2	14.4	9.6	17.5	12.4	15.6	138	8
Sorghum	5.5	15.2	8.1	14.8	11.8	14.8	115	-3
Bajra	2.6	7.2	8.0	14.6	3.3	4.1	27	-43
Maize	1.7	4.7	7.5	13.7	5.6	7.0	229	49
Small millet	1.8	5.0	2.0	3.6	1.2	1.5	-33	70
Sugarcane	57.1	158.0	126.4	230.6	196.7	249.9	244	56
Potato	1.7	4.7	4.8	8.8	14.1	17.7	729	277
Cotton* (lint)	3.0	1.4	4.8	1.5	6.4	1.4	113	0
Population in million	361.1		548.2		796.6			

MT = Metric tonnes; g = gramme; \* Cotton production in million bales

Source : Min. of Agri. (1989) Original analysis.

research to produce better yielding varieties and diversion of better areas to alternate crops.

Rice registered an increase of 173 per cent in 37 years, but per capita increase has been only 24 per cent. With the population density slightly higher in the rice eating regions and also greater percentage of the poor, the widespread distress caused by rice shortage is real. Rice is also not available in the international market easily. On the other hand a great potential goes unexploited

in the eastern high rainfall region. Again poverty of the people in the rice producing areas comes in the way of quick uplift in production. Gaps in the monsoons, late onset and early withdrawal and lack of water harvesting facilities is holding up the realisation of the potential. Inputs are at present going to the irrigated areas mostly and unless sizeable amounts of fertilisers are diverted or supplied from other sources, rice production may not pick up quickly. The area is also subjected to floods. In fact, rice and poverty go together in the

whole world. But this nexus can be broken, not at macro levels, but by way of diagnosing the problems in small watersheds and seeking the remedies with local resources supplemented with outside help. Research effort should be localised in different areas and mixed with socio-economic factors also.

Wheat has been a saviour of India. It registered an increase of 594 per cent in the total production since 1950-51 and also an increase of 214 per cent in the per capita production. But the production has now almost levelled up; profitability has fallen. Genetics research is needed to inject new vigour into the varieties. Procurement prices, though increased recently to Rs. 215 per quintal are still low compared to the cost of production, especially if the farmer's own wages are added. Labour cost has gone up; rather labour at the crucial crop stages (sowing and harvesting) has become scarce in most of the wheat growing areas. Input cost has increased much more than the procurement prices. The producer is still exploited. The farmer who produces the marketable surplus to feed the urban population is finding himself squeezed out. The young are getting disillusioned. The land holdings are becoming smaller and cannot provide the rising expectations of farmer's sons. Somehow, the Government is again thinking of a further dose of land 'reforms' which would make things more difficult for the middle level farmer who feeds the cities.

Sorghum production shows a fall of 3 per cent in per capita production; pearl millet has fallen by as much as 43 per

cent. These crops again are the mainstay of the poor people who live on the rainfed lands, especially in the Deccan Plateau and Rajasthan.

The greatest worry, however, is being caused by the shortage of oilseeds. India is spending over Rs. 1500 crores a year on import of edible oils. Per capita production has registered the growth of mere 8 per cent over 37 years. However, it is steadily falling since 1970-71. Starting from the base of 14.4 m tonnes in 1950-51, we were still around 15 m tonnes in 1987-88. Groundnut is the major crop among the nine oilseeds that are produced in the country. The biggest cause of the problem has been the national neglect of oilseeds both in research and extension. In spite of an elaborate planning set-up in the country, the synthesising philosophy of linking agricultural production to our needs and the ethos of agriculture has been missing. Research attention has gone almost exclusively to crops of wheat and rice.

Pulses have taken a fall of 41 per cent in per capita availability. No wonder the countrymen are falling prey to protein shortage and the associated diseases. Spite this not-so-happy a picture of real food production in terms of availability to the citizens, the new agricultural policy again emphasizes agricultural exports. Farmers' Journal (March 1990) says: "The prospects of augmenting the export of agricultural and allied products have considerably brightened in view of the new policy towards the farm sector announced by the Government". An Indian gets only

TABLE 3. The shrinking land-base area (ha) per capita

Year	1950	1980	2000
Availability of total land	0.89	0.50	0.33
Productive land	0.48	0.20	0.15
Land availability for animals (excluding forestland)	0.37	0.15	0.10
Land availability for animals (including forestland)	0.51	0.32	0.24

Soil Cons. Div., Min. of Agri., Govt. of India

2000 calories of nutrition, while the world gets 3000 and above. There is acute shortage of protein. The needs are more than the production. The country exports marine protein and even rice to other countries, taking advantage of the artificial surplus produced by the lack of purchasing power.

Sugarcane production has barely kept pace with our needs. Potato and other tuber crops hold a great promise. Potato production went up by 729 per cent over the 37 years and even the per capita production went up by 277 per cent. Sweet potato is more nutritious, and according to late Prof. N.R. Dhar of the Allahabad University, there is hardly a nutrition element missing from this tuber. Tubers yield large quantities, though of course, 70 per cent of their weight is just water. Cotton shows zero growth in per capita production making us dependent upon imported yarn, and making our weavers poorer in the processes.

### THE PROBLEMS

The soil Conservation Division of

the Ministry of Agriculture has figured out the shrinking land-base of agricultural production in India. The total land availability per capita decreased from 0.89 ha in 1950 to 0.50 ha in 1980; and if the current trend continues, it would fall as low as 0.33 ha in the year 2000. Productive land (cultivated, tree groves and forestland) per capita decreased from 0.48 ha in 1950 to 0.20 ha in 1980, and it will be only 0.15 ha in 2000 (Table 3). Both men and animals are growing beyond the carrying capacity of the land resource.

The problem of degradation is equally important. Nearly 53 per cent of India's land area is degraded by soil erosion (173 m ha), gullies (4 m ha), salinity or alkalinity (5.5 m ha), waterlogging (8.5 m ha), and by desertification. Droughts affect more than 260 m ha and over 40 m ha are flood-prone. We, in India, have allowed the soil to get sick, while promoting to build a superstructure of agricultural production. It is really putting the cart before the horse. We still have weak

foundations of the land under our agriculture.

The problems of Indian agriculture are many. But to focus a few fundamental ones, it is emphasised that water is the real issue. It rains for 3 months and half of the water runs off and goes waste causing floods, while for the rest 9 months the crops face drought (only 20 m ha of water have been stored in the dams, out of 400 m ha of the water resource). Weak infrastructure in the rural areas, low agricultural prices and profitability, under-employment, poverty, uneconomic and small holdings, costly inputs, indifferent power supply, illiteracy and ignorance, too many animals and of course children, dwindling forest and fuel-wood and timber supplies, all combine to make Indian agriculture an occupation, or rather a way of life for only those who have no alternative. Young men are leaving the agriculture to the tired limbs of the old.

## THE STRATEGIES

### Structural Changes

Fragmentation and smallness of holdings are now coming in the way of keeping the youth on the farms and making them earn income comparable with the urban opportunities. Inheritance laws need to be amended to prescribe the land floor levels. Land consolidation on the contours should be taken up in the whole country and completed within five years. Land should be taken out of the administration and

revenue oriented staff, and handed over to the soil and water management experts for scientific land use.

Research should be made more field oriented rather than laboratory bound covering all agroclimatic subzones and units with the object of sustainable high yields rather than a mere pursuit of high production.

Sociology and economics should be integrated with other disciplines to evolve acceptable packages of agricultural technology which are nearer to the people's aspirations and real needs. Agricultural research and development experts should interchange their posts a few times in order to keep both research and extension to the express needs of the people. Agricultural education in India should start with the children in every school. Model farmers should be created, by education and training, among all classes and sizes of land holdings; they may prove better for agricultural extension than the traditional village level workers. Agricultural scientists, ex-servicemen and others who can prove their interest and ability should be permitted to hold larger farms to become models for higher sustainable production in the area.

Remunerative prices are the crux of the agricultural problem; price fixation should include the factors like transportation, inputs, implements protected water supply, farmers expenditure on hospitals, law and depreciation of older machinery, besides



the labour of farm family. Agriculture cannot survive without subsidies. Uncertainties of agriculture must be cushioned by public intervention. Agricultural profitability should attract educated people to go back to the land and the village. Rural infrastructure of roads, markets, railways, bridges, bus services, uninterrupted power supply, strengthening of law and facilities for schools and colleges and hospitals must be provided at par with the urban areas. Otherwise agriculture would become the job of the ignorant and the backward.

The control of men and animals population has to become the most important national programme, if agriculture is to continue to provide the needed nutritional levels of the vast millions. Education would ultimately prove to be the best tool for this purpose.

#### **Watershed Management Strategy**

Watershed management means harmonious development of the land and water resources within the natural hydrologic boundaries so as to produce a sustainable and abundance of plant and animal products for the use by man, and by ensuring healthy environments and ecological balance.

Watershed is an area which drains into a stream, 'nala' or a rainwater flow line upto a point of reference. If no point of reference is given, the watershed of a stream pertains to the total drainage area of the stream upto the point it joins another bigger stream or the sea. All the rain falling upon the watershed is either

utilised within the watershed or flows out as runoff through the point of reference. For total rainwater management and its optimum utilisation, watershed is the natural and most effective planning unit. Since water is the key factor in agriculture, watershed management becomes the key strategy.

Ambekar (1990) suggests that the flatter areas of the Indo-gangetic plains, where irrigation from big rivers or canals is the dominant water resource, agricultural planning units should be the area between two drainage lines which would form the complete command area of a particular irrigation channel. Social units of village habitats also cut across the watershed boundaries. Therefore, besides development of land and water resources, watershed remains the best unit of planning for socio-economic components. A village may be completely considered within the project even if only a part of it falls within the project-watershed strictly.

A watershed management project, of 100-1000 ha size normally, should be targetted to produce all the food, fodder, fuelwood, timber and other plant and animal products needed by the people in the demarcated area.

#### **Foundation of Land and Water Development**

The rainwater must be made to infiltrate into the soil profile. The excess should be stored in a pond and recycled onto the watershed land for further use by plant and animals. Watershed management starts with rainwater

harvesting and management. Wasteful runoff is the cause of both the droughts at site and the floods off-site. Ponds should be built upon natural sites where small constriction can be plugged with earth to produce large water storage in the fan-shaped valley upstream. Where such sites are not available, excavated ponds should be constructed which are also called 'dug-outs'. It should store at least 10 cm of rainwater falling upon the upper two-third of a land holding so that the lower one-third can be levelled up and provided with 20 cm of supplementary irrigation at the critical stages of plant growth. The lower one-third of the land should be levelled up while the upper two third may be under contour farming or such other cultural methods of conservation. The present programme of 'whole farm' contour bunding should be replaced with the system of ponds and land levelling of one-third of a farmer's land. The new system would ensure, even in a drought year, the successful crops atleast on one-third of the land. In a normal year, supplemental irrigation should boost the yields by 40-120 per cent and also increase the cropping intensity by 50-100 per cent. Aquaculture, for fish, duckeries etc., would provide large cash incomes. To fight droughts and floods and also to produce 200 m tonnes of extra food from 100 m ha of the rainfed lands of the country, a programme of 10 m ponds within the next 10 years should be formulated. The cost should not be counted in money. Our large manpower could match the task, if organised into a land army as suggested by Ambekar (1990).

### **Superstructure of Conservation Production Systems**

When a firm foundation of land and water development has been laid within a watershed, only then meaningful and sustainable production systems can be built. Doing anything otherwise, would mean the damaging of land resource and escalating poverty of the coming generations. Unfortunately our government programmes have not been pursuing the logical policy which is needed for the food and also for the environmental security. Mere extension of crop husbandry has been pushed while the land and water development, though started, lag far behind the requirements.

Modern tools of remote sensing should be used to assess the land, water and plant resources of the watershed. The institutions like Soil Conservation Society of India, Indian Asso. of Soil and Water Conservationist, Indian Society of Remote Sensing and the Indian Society of Soil Survey and Land Use Planning can play a great role in the watershed management era in the country.

The rainfed farming consisting 100 m ha of lands would need at least 5 m tonnes of fertilizers (NPK) over and above the present fertilizer consumption (about 10-12 m tonnes) in the country. Organic manures, green manuring crops, azolla and other bio-fertilizers would also have to be harnessed for the balanced nutrition of plants. Special research efforts would have to be mounted to devise soil and site specific technologies for the rainfed farming situations.

### **Fodder, Fuelwood and Timber**

Of the 76 m ha of the forestland, hardly 25 m ha have the adequate tree cover (40 % canopy). Forests of India are disappearing. The basic cause is the pressure of men and the animals. The associated causes are the political interference, and general atmosphere of free-for-all. People say that if they do not cut the forest near their village, the government contractor would come and cut for use of the affluents far away. Except of national parks and reserve forest which are far away from habitats, the management of the rest of the forestland should be gradually handed over to the village institutions themselves. After all, inspite of their cattle, they do protect their rice and wheat crops, then why not protect the forests? Crops are theirs, while the forests are of the government contractor, in their perception. Unless ownership of the forestland is restored to the people, there is little hope of saving our forests. The same applies to the grasslands. The village institutions have, of course, to be strengthened and made more responsive and responsible. The Gandhian model of 'watershed self-sufficiency' would have to be adopted.

### **Agro-Industrial Watersheds**

The product from watershed should be processed within itself in agroprocessing industries which would have forward linkages with the best markets and backward linkages with the producers of the raw materials. The agro-industries should be cooperatively owned while the production systems

continue under the private care. The cooperative centre should grow into an educational and health institution with all urban facilities. All agricultural extension and inputs supplies should also be handled by the agro-industrial watershed. Such system would only check the migration of village folk to cities by providing the high class employment to the youngs in the rural areas. Areas which reach a certain production level should switch on to the agro-industrial watersheds (Bali, 1987).

### **Department of Watershed Management and All India Watershed Service**

Programmes should be converted into projects on watershed basis, to bring agriculture, forestry, horticulture, animal husbandry and rural development in a package to the village. A separate Department of Watershed Management should be set up at the Centre as well as in the States by creating multi-disciplinary, All India Watershed Services. The present departments of agriculture and forestry, etc. should confine themselves to research, education and training, and management of special areas. Unless such steps are taken, all talks of integrated watershed development and management would be futile.

### **CONCLUSIONS**

The agricultural production trends do not provide any basis for complacency. Both our food and environment security would be in great jeopardy unless watershed development and management strategy is adopted in a serious way and the tools of implementation, with people's

participation, are created in the shape of a separate watershed management department and a service. The department should use voluntary agencies, non-governmental organisations and individuals in a big way for watershed management. No doubt, a huge sum of money for millions of ponds and millions of watershed project is required. Money is not in short supply. Only our perceptions and priorities have to change. People are our wealth and their energies, when harnessed would provide all the wherewithals of success. The construction of big dams, if rephased, would release thousands of crores which should go to watershed management. The dam site comes down to less than 2 hectare metres of sediment flow per 100 sq. km of the watershed area annually. Otherwise it would silt up prematurely. If this criterion is applied, both upstream watershed management and the downstream areas would benefit from agricultural production, environmental protection, drought mitigation and flood control. Otherwise, our country would remain, in the words of Nani Palkhiwala, 'poor by policy'.

## REFERENCES

- Ambekar, V. W. (1990) Administrative changes needed for natural Resources Management in India, *Soil Con. Soc. India*.
- Anonymous (1976) Report of the National Commission. *Min. of Agri., Govt. of India*, New Delhi.
- Anonymous (1986) National Land Use Policy Outline, *Min. of Agri., Govt. of India*, New Delhi.
- Anonymous (1989) Area and Production of Principal Crops. *Min. of Agri. Govt. of India*, New Delhi.
- Anonymous (1990a) Bulletin on food Statistics, 1987-89. *Min. of Agri. Govt. of India*, New Delhi.
- AFC (1988) Evaluation Report of Soil Conservation in Catchment.
- Bali, J.S. (1988) Critical Appraisal of Watershed Policies, SPWD, *Farmers' Journal* (1990 March), Upward Trends in Farm Experts.