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Indian Agricultural Labor, a Close Look with a Climate Change Perspective: A Factual Study

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INTRODUCTION:

The last decade of the 20th century as well as the first one of the current century has marked dramatic and momentous changes in the world economy. Economic attitudes and perspectives have however changed in recent years.

"Accelerated Growth", "Growth with stability", "Growth and full employment", "Growth with social justice" all such slogans echo well but when we come on the grounds with an eye open, we feel no country have any "magic stick" to synchronize the social and economic goals and reach the certain desirable Growth.

Especially when we talk about a "two wheel economy" like India - the economy which is combination of and public private sector, instead of having a balanced and speedy movement, has been rather rolling sometimes to left and sometimes to right because of variations in factors affecting economic growth and the situation becomes much harder to the countries which are starving with the hunger of being named "Developed Country".

In this present Scenario a "Balanced Growth" is highly desirable. There should be a systematic dealing between economic growth and its consequences such as Environmental degradation. We are assuming growth is happening, growth rates are rising high but we can't remain blind folded to the by products of economic growth.

It is true that for the poor who struggle to keep food on plate, environmental issues often take a back seat to other more pressing needs to survival but it has also become evident that severe environmental degradation has occurred in the developing countries and India is one of them.

Some people and policymakers believe that economic forces of Growth are at the root of Environmental degradation and its consequences such as "Climate change". They do have a point, developers convert and deface west lands, timber companies do nude the forests, fishermen over harvest lakes and oceans, industries and automobiles pollute the water and the air and story goes on in terms of environmental degradation.

At the flip side somehow environmental degradation and its consequences are responsible to degrade live-hoods, our national human work force if I use more appropriate term "our human capital" is also threatened due to environmental issues and "Climate change" is one of them. Current Global concerns with the environment rest on the nation that "Climate change" has gone too far to the point where well being of current and future population is threatened. Due to such consequence, a consensus is emerging around the idea that implications of changing climate on human capital, population and growth has to be under control and there is certain need to keep an eagle eye on climate change impacts.

OBJECTIVES:

In view of the above points, this piece of study is undertaken. The specific objectives of this work are to:

* Study the problem of climate change and its direct and indirect implications on Agricultural labour of India.
* Have a glance on agricultural labour situation in India.

* Reveal some facts and figures representing climate change implications on Agricultural labour.
* Demonstrate how climate change is affecting human live hoods including labour force.

METHODOLOGY:

This piece of study targets to investigate the agricultural labour situation with the climate change perspective. For this work, major sources of authorized data available from Govt. Meteorological Department, Census (National Climate Centre) and India Labour organization of India are used.

A secondary data base structure was generated to investigate the agricultural labour as well as climate change aspects of India and to reveal some significant facts about this problem.

"Agricultural labour and implication of climate change" is developed as a research problem for this study.

STATEMENT OF THE PROBLEM:

This piece of study is quite centralized to talk about the Indian labour indulged in Agriculture and their problems related to climate change an overwhelming challenge for Indian Agricultural Growth.

So far as the "Indian Economy" is concerned, agriculture sector performs an important role in the economic growth we can say that it is the backbone of our economy. State and health of other sectors are highly dependable on agricultural sector.

Agriculture contributes large share of national income, does large supplies of food and fodder in country like India where large proportion of Income is spent on food. Agriculture through the provision of raw materials influences industrial structure, transport and other services. Agriculture contributes a sizeable part to exports and is an important segment of import of the country. Many more facts are there to depict the importance of Agriculture sector in Indian economy.

Thus it is obvious that Agriculture occupies a vital role in the "Indian Economy and Growth of this economy, highly depends upon "Agriculture Growth".

There is a heavy population pressure on agriculture land labour ratio is not favorable in India. Per-capita land availability is very low and on the country labour use per hectare is very high in India. Agriculture and allied sector even today provides livelihoods to about 65% to 70% of the total population but contributed only 14.6 per cent in GDP during 2009-2010, but we can't keep our eyes close towards the truth that contribution of agriculture sector is tending to fall down as it had contributed 55.40% in GDP during 1950-51. We can identify this dimension and state that there is certainly some problematic with this sector.

There may be various factors to affect Agriculture but there is a leading problem which is quite apt to catch our concentration and that seems to be "Climate change" because Indian Agriculture is highly associated with the monsoon patterns, CO_2 level in atmosphere, soil conditions, sea level, surface level, temperature, and atmospheric pressure and highly dependable upon rainfall distribution.

Due to changing climate there are certain problems which agriculture sector is having mark able downfall and those are:

* Variations in rainfall patterns
* Stream flows of rivers which are leading to floods
* Unpredictable weather and extreme weather
* Droughts
* Desertification / Aridity
* Extra tropical cyclones
* Glacial melting in Himalayan zone
* Increasing temperature
* Sea level rise.

Climate change is occurring and producing impacts on Indian Agriculture that’s why labour force indulged in Agriculture can't be remained untouched by the "Climate change Implications".

Climate change is producing many direct and indirect impacts on agriculture growth and further on the "Agricultural labour" of India.

As Sudhir Chella Rajan, Professor of Humanities and Social Sciences at the Indian Institute of Technology, Madras independently prepared the report on existing Data provided by IPCC a global body that evaluates the risk of climate change on human activity.

He suggested in his report that Global warming will affect the Monsoon patterns in India, causing a significant damage to the "Health of Indian Agricultural Sector" which plays a dominant role in the country's economy. Further he added that various aspects of climate change like sea level increasing, floods, repetitive droughts and changed rain fall patterns are not being talked much in India but these mean, displacement, migration, low production and risk to food security as well as human lives.

A GLANCE OVER AGRICULTURE, AGRICULTURAL LABOUR IN INDIA:

India has a geographical area of 328.73 million hectares of which reported area for land use is 306.04 million hectares. The net area cultivated is about 142.60 million hectares i.e. about 46.6 per cent of the total reported area.

Since nearly 50 million hectares of area is sown more than once, the cropping intensity works out to 135.1 forests accounts for about 68.97 million hectares i.e. 22.5 per cent of the total reported land area.

Also nearly 13.97 millions are cultivable waste lands and 9.91 million hectares are fallow lands. Only about 30 per cent of the total cropped area is irrigated and the remaining area is rain fed which depicts very well that Indian crops are highly dependent on "Monsoon".

According to population on census of India 2001, there are about 402.5 million rural workers of which 127.6 million are cultivators and 107.5 million are agricultural labours (Table 1.1).

TABLE 1: POPULATION & AGRICULTURAL WORKERS
(In millions)

Year	Rural population	cultivators	Agricultural labour	Other workers	Total Rural
1951	298.6	69.9	27.3	42.8	140
1961	360.3	99.6	31.5	56.6	188.7
1981	523.9	92.5	55.5	96.6	244.6
1991	628.7	110.7	74.6	128.8	314.1
2001	741.7	127.6	107.5	167.4	402.5

Source: Registrar General of India, Ne Delhi, 2001.

In other words, pure agricultural workers constitute nearly 58.4 per cent of the rural population of which 31.7 per cent are owner cultivators and 26.7 per cent are mainly agricultural wage earners (Agriculture statistics at a glance, source from Registrar General of India, New Delhi, 2001).

Laws governing labour standards in Agriculture:

The Government of India has passed a number of laws in order to promote labour standards in agriculture. These laws are also in conformity with various relevant international labour organization (ILO) conventions such as :

(i) Minimum wage fixing machinery (Agriculture) convention 1969 (129).
(ii) Equal Remuneration convention, 1951 (No. 100).
(iii) Discrimination (Employment and occupation) convention 1958 (No. 111).
(iv) Forced labour convention, 1930 (No. 29).
(v) Abolition of forced labour convention (1957, No. 105).
(vi) Minimum age convention, 1973 (No. 138).
(vii) Worst form of child labour convention 1999(No. 187).
(viii) The safety and Health in Agriculture convention, 2001 No. 184).
(ix) Plantation convention 1958 (No. 110).

Govt. of India's Ministry of Labour and Employment presented a Report on "Employment and Unemployment Survey 2009-10".
Some significant findings related to my research piece from this survey are as following which are quite apt to highlight the contribution of Indian labour work force in Agriculture sector :

TABLE 2 : INDULGENCE OF WORKFORCE IN AGRICULTURE BASED ON EMPLOYMENT CRITERIA

S.No.	Type of employment	No indulgence out of 1000
1.	Employed	455 / 1000
2.	Self employed	572 / 1000
3.	Rural self employed	694 / 1000
4.	Casual employed	467 / 1000

Source: Ministry of labour and employment, Govt of India Survey 2009-2010.

* The survey result reveals that 455 persons out of 1000 employed persons are employed in agriculture forestry and fisheries group.
* In the rural sector 576 persons out of 1000 persons employed are engaged in the agriculture, forestry and fisheries group.
* Among the self employed persons, majority of them are employed in agriculture, forestry and fisheries, that is 572 persons out of 1000 persons.
* In the rural sector, 694 persons out of 1000 self employed persons are engaged in the agriculture, forestry and fisheries group.
* In case of casual labour category 467 persons out of 1000 are engaged in agriculture, forestry and fisheries.

This paper gives some factual findings based on population census of India 2001, revealing the statistical information of labour indulged in Agriculture and allied sector, based on the criteria of male / female, rural / urban, main workers / marginal workers (Table 3):

TABLE 3: TOTAL, MAIN AND MARGINAL WORKERS IN AGRICULTURE AND FISHING AND FORESTERY IN INDIA

TRV	Persons			Males			Females		
	Total workers	Main	Marginal	Total workers	Main	Marginal	Total workers	Main	Marginal
Total	13245693	9855702	3389991	7293494	6237754	1055740	5952199	3617948	2334251
Rural	11957743	8295957	3161786	5928575	4985459	939116	5529168	3306498	2222670
Urban	1787950	1559745	228205	1364919	1248295	116624	423031	311450	111581

Source: Registrar General of India, New Delhi, 2001.

There are total 1,32,45,693 persons indulged in Agriculture and allied sector. 86.50% are from rural India and rest 13.5% belongs to urban India
There is total 55.1% total indulgence of male workers.
(i) Out of them 81.29% belongs to Rural India and rest 18.71% belongs to urban India.
(ii) Out of them 85.52% are male main workers and rest 14.47% belongs to male marginal group:
  (a) Out of male main workers 79.9% belongs to rural area and rest 20.1% belong to urban area.
  (b) Out of male marginal workers 88.95% belongs to rural area and rest 11.05% belongs to urban area.

* There is total 44.90% indulgence of female workers:
  (i) Out of them 48.30% people belong to rural area and rest 23.70% belongs to urban area.

(ii) Out of them 60.8% people are female main workers and rest 39.2% belongs to female marginal workers.
(a) Out of female main workers 91.39% are from rural area and rest 9.61% is from urban area.
(b) Out of female marginal workers 95.22% people belong to rural area and rest 4.78% people belong to urban area.

GLANCE OVER "CLIMATE CHANGE" OCCURRENCE IN INDIA :

India is home to an extraordinary variety of climatic regions, ranging from tropical in the south to temperature and alpine in the Himalayan north, where elevated regions receive sustained winter snowfall. The nation's climate is strongly influenced by the Himalayas and the Thar Desert. Land areas in the north of the country have a continental climate with severe summer conditions that alternates with cold winters when temperatures plunge to freezing point. In contrast are the coastal regions of the country, where the warmth is unvarying and the rains are frequent.

Agricultural labour and implication of climate change is generated as the research problem for this study so here are some indicators which very well define the climate and produce diverse impacts over Indian agriculture as well as on the work force indulged, those are Agricultural labour.

(1) Temperature:

The annual mean temperature for the country as a whole during 2010 was $\pm$ 93°C above 1961 - 1990 average, thus making the warmest year on record. This superceded the previous five warmest years, which have all occurred since turn of the century, notably 2009 (0.92), 2002 (0.71), 2006 (0.56), 2007 (0.55). Shown in the table 4.

The recent decade was the warmest decade on record over India with decadal mean temperature abnormally of + 0.60°C.

TABLE 4 : TEMPERATURE RANKING 2001-2010

Ranking (2001-2010)	**Year**	**Temperature (°C)**	**Anomaly (°C)**
Warmest	2010	25.8023	0.9319
2	2009	25.7876	0.9172
3	2002	25.7366	0.7084
4.	2006	25.5024	0.6016
5.	2003	25.4720	0.5600
6.	2007	25.4430	0.5528
7.	2004	25.4232	0.5143
8.	2001	25.3848	0.4292
9.	2005	25.2800	0.4096
Coldest	2008	25.2562	0.3857

Source: IMD Climate Report, 2010.

* **Decadial variation in temperature:**

The mean temperature during different decades over the 1901-2010 is shown in the table 5. It is found that the decade 2001-2010 has been the warmest decade with a temperature anomaly of 0.4°C.

TABLE 5 : DECADAL VARIATION OF TEMPERATURE IN INDIA

S.No.	Decade	Mean temp. (°C)	Anomaly with Respect to 1961-1990°C
1.	1901-1910	25.1	-0.2
2.	1911-1920	25.2	-0.2
3.	1921-1930	25.3	-0.1
4.	1931-1940	25.2	-0.2
5.	1941-1950	25.5	-0.1
6.	1951-1960	25.7	0.0
7.	1961-1970	25.7	-0.1
8.	1971-1980	25.7	0.0
9.	1981-1990	25.9	0.1
10.	1991-2000	26.1	0.2
11.	2001-2010	26.3	0.4

2. Rainfall Features: Indian Agriculture is highly dependable on rainfall patterns and due to climate change Indian rainfall patterns are facing excess rainfall, deficits rainfall and scanty rainfall patterns in various parts of India. Let's have a glance:

The annual rainfall over the country as a whole was 101% of its long period average (LPA) in 2010, 80% in 2009, 93% in 2008, 99% in 2007. Shows in (Table 6).

TABLE 6 : ANNUAL RAINFALL OVER THE COUNTRY

S.No.	Year	% of LPA
1.	2010	101%
2.	2009	80%
3.	2008	93%
4.	2007	99%

Season wise rainfall distribution over the country as a whole was as follows in the table 7.

TABLE 7 : SEASON WISE RAINFALL DISTRIBUTION

S. No.	Season	2007 (% of LPA)	2008 (% of LPA)	2009 (% of LPA)	2010 (% of LPA
1.	Winter (Jan. Feb.)	87	86	55	56
2.	Pre-Monsoon (March-May)	84	85	71	95
3.	Monsoon (June-Sept.)	106	98	78	102
4.	Post Monsoon (December)	68	70	108	121

Both the tables show that their are makeable changes and variations in annual as well as seasonal rainfall patterns.

3. Tropical storms and Cyclones:

Following table shows that Indian climate is facing severe storms and cyclones which adversely impact the livehoods and cause migration, untimely death and displacements.

India faced about 16 huge cyclones during last 4 years including GONU, SIDR, NARGIS, RASHMI KHAI, MUK, NISHA, BIJLI, AILA, PHYAN, WARD, PHET, GIRI, JAL (Table 8).

TABLE 8 : TROPICAL STORMS IN THE INDIAN SEASON AND COASTAL ZONES

Year	No. of storms	Name of the storm	Orison area	Duration / Season
2007	4	Moderate storm GONU GONU SIDR	Bay of Bengal Bay of Bengal Arabian Sea Bay of Bengal	Pre-monsoon Monsoon Monsoon Post Monsoon
2008	4	Nargis Rashmi Khai MUK Nisha	Bay of Bengal West Central Bay South west Bay South West Bay	Pre Monsoon Pre Monsoon Pre Monsoon Pre Monsoon
2009	4	Bijli AILA PHYAN WARD	Bay of Bengal East Central Bay East Central Arabian sea West Bay of Bengal	Pre Monsoon Pre Monsoon Post Monsoon Post Monsoon
2010	4	LAILA PHET GIRI JAL	South east Bay of Bengal Arabian Sea Bay of Bengal Bay of Bengal	Pre Monsoon Monsoon Post Mosoon Post Monsoon

Source: Annual Climate Summary 2007, 2008, 2009, 2010.

Further then this many extreme weather events occurred in post years such as floods, draughts, Heat waves, and cold waves and associated loss of lives, damages, migration, displacement, untimely death and loss to biodiversity. Some how agriculture workers and coastal workers related to agricultural allied sector are also being hazardously affected due to climate change consequences.

POSSIBLE/POTENTIAL OF CLIMATE CHANGE ON AGRICULTURAL LABOUR

As we discussed before India is confronted with the challenge of sustaining rapid growth of Economy amidst the increasing global threat of climate change. Evidence has shown that climate change will affect the distribution and quality of India's natural resources, which will untimely threaten the livelihoods of the most poor and marginalized sector of the population who are closely tied to India's natural resource base. More than 56% of workers are engaged in agriculture and allied sectors, while many others earn their living in coastal areas through tourism or fishing.

While climate change affects everyone. It is the India's poor those are agricultural workers who are on the front line in this piece of study of mine.

There are certain related hazards of Climate change such as ozone to depletion thermal stress, extreme weather events, moderately droughts, floods, excess rainfall, scanty rainfall, forest fires, storms, heat waves, cold waves and cyclones.

These climatic events, produce such severe impacts on agricultural labour force directly as well indirectly, while going through this study some potential direct impacts are identified including Death, drowning illness, injury, habit alteration, infectious diseases. These consequences also directly affect the production, water quality and water quantity.

This paper tried to have a close look over the potential indirect impacts of climate change there is certain a huge problematic outburst.

People have to face (i) loss of housing (ii) mental/physical stress due to displacement and extreme weather events such as storms, floods, cyclones, desertification and droughts.

Further people have to risk in the food security and malnutrition due to many consequences generated by climate change.

- Here are some issues which I would like to have under detailed coverage.

Food security:

Although agriculture reduced to contribute in India's GDP by time, its importance in the country's economic, social and political fabric goes well beyond the scale of the reduction.

In India smaller farms are dependent on timely and sufficient rainfall the monsoon for high crop yields. However, with the changing climate, rainfall patterns have become erratic and reduced and farmers are exposed to many risks including drought, floods, disease of both crops and agricultural labour.

Indeed it's estimated that every 1°C. increase in temperature is likely to lead to a 5-10% reduction in yields of some crops (Pachauri, 2009).

Here I would like to add the words of FAO director general Jacques Diouf. He said while launching the "knowledge on wheels" programme at the M.S. Swaminathan Research foundation.

"Greater frequency of droughts and floods would affect local production negatively. Rain fed agriculture in marginal areas and sub humid regions is mostly at the risk for Food"

Food security has deteriorated since 1995 and reductions in child malnutrition are unlikely to reach targets set by the MDGs by 2015.

Climate change is having a significant impact on food security and malnutrition, as changes in pattern of extreme weather events will affect the stability and indeed access to food supplies.

2. Health:

As the climate changes, there is going to be an increasing impact on human health. Temperatures will rise and lead to an increasing frequency of heat waves, ultimately increasing indices of illness and death in India. Food and water supplies will be affected and the rate of disease will increase, predominantly affecting the poor and marginalized people of agricultural sector and are often forced to live in rural areas with limited access to water and sanitation.

Below are just some examples of the health implications that can be linked with climate change:

Bacterial Infection:

Rates of diarrheal, cholera and other bacterial diseases are set to rise as temperature rise and water quality issues increase. Bacterial infection from contaminated water is expected to increase as heavy rainfall and rising temperatures lead to pollution of drinking and recreational waters. The occurrence of Salmonella and E.coli amongst other food poisoning bacteria, are further known to be associated with rises in ambient air temperature (Fleury et al. 2006).

Vector-borne disease:

With climate change, geographical ranges and survival of species bearing diseases will vary. Warmer, water climes, particularly during breeding season could enable malarial mosquitoes to spread their range and survive longer, leading to increase rates of dengue fever and schistosmiasis (Bhattacharya et al. 2006).

Respiratory Disease:

The quality of air is likely to decrease as surface ozone concentrations begin to shatter with increasing temperatures. This will lead to an increasing incidence of asthma and other cardio vascular respiratory diseases (Liggins 2008).

Under nutrition:

Rising temperatures and variable rainfall will ultimately lead to an increase in crop failures and therefore a decline in food security especially for crops staples such as rice and wheat. Poorest regions will be the most affected and rates of under nutrition will begin to increase (Cohen et al. 2008).

Population Displacement: - Migrations

India's population is predicted to be grown by 500 million by 2050 (UN 2008). This increase in population will undoubtedly lead to strain on resources, especially when coupled with the impacts of climate change.
Let's have a glance on displacement of population due to extreme climatic change events.

- Govt. of India's metrological department reported in "Annual climate summary" that in year 2007 - due to floods, total 10 lakhs, 13 thousand displacement and migration were occurred and severely affected states were Himachal Pradesh, Gujarat, Kerala, West Bengal, Orissa and Andhra Pradesh.
- In year 2008 total 10 lacs people were displaced and hazardously affected states were Uttar pradesh, Jharkhand, Orissa, Bihar and Andhra Pradesh.
- In year 2009 about 2500 villages were destructed in Arunachal Pradesh - due to flood severe cyclonic storm "AILA" occurred in Sikkim and 380 people were died.
- In year 2010 - 120 people died and 80,000 homes were destroyed due to "Toranado" on April 13th. Again severe cyclonic storm "Laila" occurred in coastal Andhra Pradesh and 50,000 people were forcefully migrated and displaced.

We can add here the case study output of Hazra, S.S. "Vulnerability assessment". "The Sunder ban Island in West Bengal are sinking, 7,000 people already been displaced and by 2030, it is anticipated that over 70,000 people from this area will be exposed to the risk of losing their homes and livelihoods due to sea level rise, increased cyclone intensity and flooding" he said.

4. Decline of Biodiversity:

Biodiversity simply means the variety of life forms that exists on planet earth. They range from the smallest and practically invisible microbes to the largest of mammals and sea creatures. When we are discussing the issue of climate change, it is certainly implicating adverse effects on the biodiversity specially in the agriculture. Biodiversity is declining due to acid rains, droughts, floods and other extreme weather events the co-product of climate change.

5. Mental stress to the Agricultural Workers:

Droughts, failure of rainfall and loss of crops due to climatic disbalance are the great source of distress and mental burden to the agricultural labour because their all efforts in their work zone are highly slave of the climate and uncertainties in weather impact negatively on agricultural labours' mental health.
Climate change is having a significant impact on food security and malnutrition, as changes in pattern of extreme weather events will affect the stability of and indeed access to food supplies.

CONCLUSION & SUGGESTIONS:

This paper suggests that in India where agriculture contributes very significant role in economic growth. Relevant data revealed that climate change is occurring rapid increase in temperature, irregularity in rainfall patterns and consequences of extreme weather events which further are impacting so called "Human capital" of our India including agricultural labours in form of threat to food security, adverse impact on health, people are facing untimely death, migration and displacement. This kind of loss further leads to poverty, employment and illness of this group. Herewith are some suggestions:

Suggestions:

* Indian agriculture is facing great diversity of needs, opportunities and prospects that's why future growth needs to be more rapid, more widely distributed and better targeted.
* Responding to the challenges like "Climate change" may help Indian economy to proceed to sustainable growth.
* There is certain need to solve the problem of climate diversity.
* Indian agriculture is in such a need of higher value cropping pattern so that productivity can be increased.
* There is a strong requirement for both a strong research and extension system and skilled farmers.

* Agricultural research and agriculture technologies should be enough implacable in a country like India which is still developing.
* There is certain need of economic as well as sociological betterment of Indian economy.
* Building up the understanding and technical knowledge towards science based agriculture is required to cope up with the "climate change".
* Govt. should ensure effective availability of irrigation facilities to agricultural labour force to cope up with the problem of rainfall dependability.
* Agricultural labour force should advocate locally for more energy options as more sustainable and cleaner option that will contribute to reduce climate change in impacts in long term.
* Identification of local vulnerability is desirable to avoid long term impacts of climate change.
* There is need to aware the agricultural labour force about the issues of climate change.
* Definitely it's time to proceed with "Zero carbon activities.
* Govt. should seriously pay attention to expand the schemes in favour of agricultural labours which cover the risks of climate change.

Finally I will wind-up by saying that "There is still opportunity to avoid the most damaging climate change impacts but time is quickly running out. The world has less than decade to change course and its time to act by identifying the factors causing climate change and then collective action to combat and cope with its "Adverse Effects On Agricultural Labour".

REFERENCE:

1. Indian Council of Agricultural Research, 1998, National Agricultural Technology Project PP 193, ICAR, New Delhi.
2. Indian Agricultural in Brief 2009-10. Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India, New Delhi.
3. Human Development Report 2007-2008.
4. Annual Climate Summary of India during 2010 by Indian Meteorological Department, 13 January, 2001.
5. Kadekodi, G.K. "Environment and Development", Environmental Economics. An Indian perspective. Oxford University Press, New Delhi, 2001.
6. Mint, Online e-pate, Aug. 7, 2007.
7. Annual Climate Summary, 2007, 2008, 2009, 2010. Govt. of India, Ministry of Earth Sciences. Indian Meteorological Department.
8. Cohen, M.J. " Impact of Climate Change and Bioenergy on Nutrition". International Food Policy Research Institute.
9. Pachauri, R.K. "Climate Change and its Implication for India's Fragile Ecosystem". Policy notes for parliamentarians CLRA : New Delhi.
10. ICAR Report 2007.
11. IPCC, The 4th Assessment Report 2007.
12. **National Workshop on Climate Change and its impact on health Lonavala, 2007.**