Int. Journal of Management and Development Studies 5(4): 22-32 (2016)
ISSN (Online): 2320-0685. ISSN (Print): 2321-1423
Impact Factor: 0.715

The Potential of Rain fed Agriculture in India-An Assessment

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Introduction

The agricultural productivity has seen a rapid growth since the Planning Era due to new crop varieties, fertilizer use and expansion in irrigated agriculture. The world food production outstripped the population growth. However, there areregions of food insecurity. Of the about 2700 billion population today (United States Census Bearau,2013), about 925 million people do not have enough food to eat. Food and crop demand is estimated to double in the coming 50 years.As per Comprehensive Assessment, it is possible to produce food – but it is probable that today's food production and environmental trends, will lead to crises in many parts of the world. The assessment as also indicated that the world's availablel and and water resources can satisfy future demands by so many solutions. One of the best solutions is rainfed agriculture.

Rainfed areas are highly diverse, ranging from resource-rich areas with good agricultural potential to resource-poor areas with much more restricted potential. Somere source-rich rainfed areas potentially are highly productive and already have experienced widespread adoption of improved seeds. In drier, less favorable areas productivity growth has lagged behind, and there is widespread poverty and degradation of natural resources. Rainfed agriculture should receive greater emphasis in public investments, a key issue is how much investment should be allocated among different types of rainfed agriculture. Outmigration and income diversification into the nonagricultural sector must provide the long term solution to economic development of many resource poor areas, but these opportunities currently are inadequate in relation to population growth to provide short to medium term solutions.

There is a need to identify the opportunities for stimulating agricultural growth and reducing poverty and environmental degradation in rainfed areas. Similarly there is a need to assess the opportunity costs of diverting scarce public resources from resource-rich to resource-poor areas. The tradeoffs between investing in resource-rich and resource-poorareas in terms of their productivity, poverty and environmental outcomes need to be understood in order to guide public policy decisions toward productive outcomes.

Developing strategies for rainfed areas is difficult because of their diversity in terms of agro-ecological characteristics, infrastructural development, and other socioeconomic variables.

Rainfed Agriculture

In India rainfed agro-ecologies contribute 60% of the net sown area, 100% of the forest, 66% of the livestock and provide livelihood, income, employment and environmental security. About 84-87% of pulses/minor millets, 80% of horticulture, 77% of oil seeds, 66% of cotton and 50%

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of cereals are cultivated under the un-irrigated conditions. Rainfed areas are complex, diverse, fragile, under-invested, risky, ethno-economically unique and distress prone.

During the period of 1985 to 1995, growth rate of un-irrigated agriculture was higher than the irrigated production systems. Post 1995 years witnessed deceleration of the overall growth in agriculture and was relatively of higher magnitude in the rainfed situations. This was primarily due to over exploitation of ground water resources in the dry land areas, lack of diversification in the high rainfall regions and adverse terms of trade especially for the vegetable.

Rural development is being supported by the Ministries of Agriculture, Rural Development, Water Resources, Environment and Forests, Panchayati Raj and others. Convergence, harmonisation and rationalisation of the various programmes, enabling policies, governance, investment portfolio and capacities are essential to harness their synergies and complimenta. Watershed management for the integrated development of natural resources of ridge to valley in system perspective is necessary to realize environmentally benign development processes. Alternative insurance and credit systems including consumption and entire livelihood can reduce the risks and mitigate the adverse impacts of climatic changes.

NRAA has been created to harness and harmonise tremendous potentials of the rainfed agriculture by converting weaknesses into strengths and threats into opportunities by appropriate policies, programmes, professionalism, capacity building, monitoring and evaluation. The mandate of NRAA include preparing a Perspective Plan for holistic and sustainable development of rainfed areas, coordinate and bring convergence within and among agriculture and watershed development programmes, promotion of farming systems, micro-enterprising, diversification, safety-nets, common property resource management, forest rehabilitation and internalisation of social capital of landless and asset-less and monitoring of these activities at the Centre and State level. . Transparency, cooperation, contribution and participation of local communities, bodies, NGOs, professionals and Government organisations is being looked upon to galvanize a sustainable growth and development process for the holistic and integrated development of rainfed areas.

Characteristics and Issues

Basic Facts

Extent of problem of Rainfed Agriculture In India, about 60% of total net sown area comes under rainfed lands. Rainfed crops account for 48 percent area under food crops and 68 percent under non-food crops. The remaining 60%, which accounts for a substantial part of agricultural output, is rain-dependent. India ranks first among the rainfed agricultural countries of the world in terms of both extent and value of produce. Due to population pressure on agricultural lands, the poverty is concentrated in rainfed regions. The climate in India's rainfed regions is characterized by complex climatic deficiencies, manifested as water scarcity for rainfed crop production. The climate is largely semi-arid and dry sub-humid with a short (occasionally intense) wet season followed by long dry season. Rainfall is highly unreliable, both in time and space, with strong risks of dry spells at critical growth stages even during good rainfall years.

Issues Related to Rainfed Farming

Issue 1: Farmer suicides in Rainfed areas

In past, the Rainfed farming system was mainly dependent upon the locally available inputs (seeds, manures, animal draft) and used to grow a number of crops, which were able to withstand drought-like situation. In recent times, the cropping systems have changed and at present the farmers in these rainfed areas have limited options. Many of the farmers in these regions started cultivating high value crops which requires intensive use of costly inputs (chemical fertilizers/ pesticides, hybrid seeds, life saving irrigation, farm energy etc.) and find it difficult to manage the resources on their own. This is the major reason of growing farm suicides in rainfed areas

Issue 2: Green Revolution - Rainfed Areas

Green Revolution was designed around growing high-yielding varieties of wheat and rice, which needed plenty of water and chemical inputs. The entire agricultural research framework, incentive structure, price support, input subsidies, extension system were designed to 'flow' along with irrigation. In the floodplains of the north, the farmers, realising rainfall risk was a thing of the past, switched to HYVs because canals were there for irrigation. But it was different in the drylands. Here, seeds and fertilizers reached but there was scarcity of water . Those who wished to adapt to the new seeds and fertilizers, created the predictable water supply for themselves. When electricity came, these farmers invested in groundwater pumps. The result was tube wells became the mainstay of irrigation in India. According to a Planning Commission report, titled 'Synopsis of Groundwater Resources in India', in 1960-61, canals and tanks accounted for 61% of non-rain water for irrigation, compared to 0.6% for tube wells. In 2002-03, the share of canals and tanks was down to 33%, while tube wells had increased to 39%.

Issue 3: Green Revolution – Rainfed areas

Change in the Cropping patterns to reduce their vulnerability to rains, farmers in some areas grew crops such as jowar, bajra and pulses. These crops are low-yielding, but less affected by variations in rainfall. This saved the farmers from the risky nature of farming in rainfed and dry areas. In the same field, they planted multiple crops. However, with the advent of green revolution and advent of electricity and groundwater tube wells, the cropping patterns also changed. For example, the farmers of Malwa (MP) used to grow jowar during the rains and MalwiGhehu , a local wheat variety, after that till the advent of Green revolution. However, once the pumps came in, farming became a year long activity. Cash crops like soya displaced jowar. HYVs of wheat displaced MalwiGhehu. This is the story of almost all parts of India, and that is the reason that cotton, maize and soya remain the major crops of the rainfed areas of India

Issue 4: Groundwater level

The too much exploitation of the groundwater by tube wells led to the depletion of this finite resource. For example, in some parts of Madhya Pradesh, the groundwater levels have plunged from 50 ft in the 1970s to 700 ft now. Today, it has taken a shape of acute crisis in six states of India. The six states where the level of groundwater is unsustainable are Punjab, Rajasthan, Haryana, Tamil Nadu, Gujarat and Uttar Pradesh. Ironically, these six states accounted for half the food-grain production in 2008-09.

Objectives

The present study was conducted with the following Objectives:

- To identify dominant rainfed districts for major rainfed crops.
- To make an assessment of the surplus runoff water available for water harvesting and supplemental irrigation
- To estimate the water-use efficiency and incremental production for important rainfed crops.
- Finally to conduct a preliminary economic analysis of the water harvesting/ supplemental irrigation to realize the potential of rainfed agriculture.

Methodology

Large public investments were made for development of irrigation infrastructure in different river basins spread across the country. Over a period of time, irrigation along with high input uses resulted in significant improvement in total production in specific regions. However, this also triggered changes in cropping pattern resulting in replacement of low water consuming crops (coarse cereals, puses, oil seeds) with high water requiring crops (rice, sugarcane, winter maize). There is a high variability to response to irrigation due to input variability (seeds, fertilizers, mechanization etc.) at the farm level, source of irrigation (canal, groundwater, other sources), and socio-economic condition of the farmers. Due to limited and regulated supplies groundwater and harvested water from surface runoff allow higher water use efficiency as compared to canal irrigation. Most of the dryland crops depend for limited irrigation on sources other than canal irrigation.

The effect of irrigation (and no irrigation) was studied for various crops in 16 major states of the country covering arid, semi-arid and dry sub-humid climatic regions with a rainfall of less than 1500 mm per annum. The districts with same agro-climatic conditions having both irrigation (more than 30% irrigated area for the crop in the district) and rainfed (less than 30% irrigated area for a crop in the district) were identified for each crop. Quinquennial average production, total area and irrigated area (for the period ending 2000-01) and the agro-eco subregion were utilized from constructing the data set. AESRs, which area having either exclusively irrigated or rainfed districts, were eliminated to avoid skew effects.

Identification of Dominant Rain-Fed Districts

To make an improvement over the existing criterion of the ‘fixed’ or ‘variable’ percentage ofthe irrigated area in the district, all the districts in the descending order of area coverage (fora given crop) limited to a cumulative 85 % of total rain-fed area for each crop in the country, 244 were identified and termed as ‘dominant rain-fed districts’ (for a given crop). The crops covered are sunflower, soybeans, rapeseed mustard, groundnut, castor, cotton, sorghum, pearl millet, maize, pigeon peas and rice (in kharif), and linseed and chickpeas (in rabi). Thus an area of 39 M ha was accounted under selected crops. This helped in the identification of the major region for a crop, in that although all the crops are grown in most of the districts, there are a few crops that have specific agro-climatic requirements. Development activities related to a specific rain-fed cropshould be taken up first in these identified districts and secure a major impact on productivity.

Potentials for New Investments in Water Management Techniques

Potentials for new investments in water management techniques of water harvesting has become the backbone in furthering the watershed programs in rainfed areas in most states of India.

The available runoff can be harvested and utilized broadly for two purposes- to provide supplemental irrigation to the standing kharif crop to offset mid-season dry spells/ terminal drought (flowering- grain filling stage) or facilitate sowing of the next rabi crop. On-station studies have shown strong benefits from supplemental irrigation but the extent may vary depending upon variation in soils, seasonal rainfall distribution, and rainfall occurrence after supplemental irrigation and several others input and management related factors. Thus it is difficult to establish a constant of water use efficiency at district or agro-eco sub region level.

Strategies

There are two broad strategies for increasing yields in rainfed agriculture crop growth: (1) capturing more water and allowing it to infiltrate into the root zone; and (2) using the available water more efficiently (increasing water productivity) by increasing the plant water uptake capacity and/or reducing non-productive soil evaporation. There is a wide spectrum of integrated land and water management options for use in achieving these aims. While most techniques, such as external water harvesting systems, focus on capturing more water, several focus on increasing water productivity directly; e.g., drip-irrigation and mulching. Management approaches aimed at capturing more water often lead also to higher water productivity, as denser crop canopies shadow the soil and thus reduce soil evaporation.

- A distinction is often made between in-situ water harvesting; i.e., the capture of local rainfall on farmland, and ex-situ water harvesting; i.e., the capture of rainfall that falls outside the farmland (Oweis and Hachum, 2001).
- Supplemental irrigation systems are ex-situ water harvesting systems, providing water during periods when rainfall is insufficient to provide essential soil moisture to secure a harvest. In such systems, water scheduling is not designed to meet the full plant water requirements. Instead, the critical importance of the systems is their capacity to bridge dry spells and, consequently, to reduce risks in rainfed agriculture. The potential yield increase in supplemental irrigation varies with rainfall. Several studies indicate that supplemental irrigation systems are affordable for small-scale farmers. However, policy frameworks, institutional structures, and human capacities similar to those for full irrigation infrastructure are required to successfully apply supplemental irrigation in rainfed agriculture.
- Soil and water conservation, or in-situ water harvesting, has been the focus of most of the investment in water management in rainfed agriculture during the past 50 years. Since in-situ water harvesting can be applied on any piece of land and is affordable to most smallholder farmers, these management systems may already be in place prior to investing in ex-situ water harvesting.
- Soil Evaporation; because evaporation management (i.e., shifting non-beneficial soil evaporation to beneficial transpiration) does not directly impact local runoff, this strategy creates a large opportunity for improving yields from rainfed agriculture without affecting downstream water users and ecosystems. By contrast, water harvesting strategies that decrease runoff can have negative impacts downstream. However, capturing runoff close to the source, as is the case for water harvesting systems, may

result inlower consumptive water losses by reducing the transmission losses encountered when locally generated surface runoff flows to downstream rivers.

Comparing Harvestable Surplus during Drought and Normal Seasons

As per the current practice, the season/ year with 20% deficient than the normal rainfall is declared as a drought year.

Though there is good amount of surplus available as runoff in a season, the entire surplus is not available at one time during the season. Under the southwest monsoon, usually there are two peaks of rainfall during the season: first peak during the onset phase and second during the withdrawal phase. During these two phases, there is a better certainty in overflows. Even if it is a broader peak, the skew ness of peak is more towards withdrawal phase resulting in runoff at the end of the season. Thus, at least some runoff during withdrawal phase in September is a certainty even if early period is affected by aberrations in monsoon. This would be resulting in harvestable surplus, which could be used subsequently during terminal droughts/ dry spells.

Balance of Water to Nature and Humans

Upgrading rainfed agriculture may result in water trade-offs with downstream users and ecosystems, particularly in closed and closing basins, where more water is used than is renewably available during some portion of the year. In other cases the downstream impacts on stream flow from small-scale water storage systems have been limited, even if implemented wide.

During drought years also about 31 billion cubic meters is available as surplus after making provision forsupplemental irrigation for about 20 M ha. Thus it can be seen that water harvesting and supplemental irrigation do not jeopardize the available flows in rivers even during drought years or cause significant downstream effects in the study areas. Moreover areas with inadequate runoffs have already been excluded from the areas with potential for runoff harvesting.

Estimation of Seasonal Rainwater Use Efficiency of Selected Rainfed Crops

The average and range of WUE values estimated for different crops cutting across the dominant districts. These values may be low in comparison to experimental data available through Indian national agricultural research system or elsewhere due to differentially adopted technologies by farmers based on socio-economic background and market conditions. Achievable yields from on-farm trials and long term average rainfall for each dominant district and for different crops was used for estimating the ‘achievable water use efficiency’ (Data from All India Coordinated Research Project on Dryland Agriculture with 30 network stations). The maximum and minimum values represent the spatial variability among dominant districts.

Potential of Rainfed Production through Supplemental Irrigation

Under traditional production systems and existing management practices (business as usual , no change in varieties and production inputs) an average of 12% increase in production cutting across drought and normal seasons is realizable with provision of supplemental irrigation alone. Our estimates at the regional level indicate that rainfed production can be enhanced to an extent of 3 times the traditional production with improvement in agronomic practices and provision of supplemental irrigation. Significant production improvements can be realized in rice, sorghum, maize, cotton, sesame, soybeans and chickpea crops.

Water Management in Rainfed Agriculture - RRA

RRA is a policy initiative and not a funding initiative. It has a specific set of objectives (outlinedbelow):

- To bring together existing knowledge on rainfed areas;
- To identify key areas where public investment is required;
- To explore forward and backward linkages of such investments;
- To bring out possible ways of financing such investments through ongoing government programmes like RKVY or NREGS;
- To propose new ways of stepping up such investments; and
- To lay on the table the forms such investments (both public and private) should take.

RRA network will involve collation of existing knowledge to facilitate policy dialogues and to integrate newer lessons from rainfed farming to the existing knowledge base. This will enable healthier engagement with policy makers and scientists in policy dialogues, based on these knowledge products. The pilots intend to generate new knowledge through such initiatives – knowledge with an uptake potential. Five scenarios for pilots involving water management in rainfed areas emerged as a consequence of the discussions, especially from the May-2010 workshop held in Pune. These five scenarios are:

1. Choice less rainfed agriculture, because of lack of choice.
2. Erratic support, especially with regard to protective irrigation.
3. Most assured irrigation, as protective irrigation in Kharif. Rabi irrigation virtually not present.
4. Support irrigation for Kharif but then Rabi and horticulture not supported (Maharashtra is classic example 400-600 mm rainfall)
5. Number of 'rainfed-by-choice-farmers' limited. Every farmer irrigates in India if has a choice.

Projects for rainfed agriculture in india

Goernment of India has accorded highest priority to the holistic and sustainable development of rainfed areas through interated watershed development approach. The key attributes of the zwatershed approach are conservation of rainwater and optimization of soil and water resources in a sustainable and cost effective mode. Improved moisture management increases the productivity of complementary.

National Watershed Development Project for Rainfed Areas (NWDPRA)

NWDPRA was launched in 1990-91 during Eighth Five year Plan in 25 States and 2 Union Territories. The project was continued during Ninth Five Year Plan in 28 States (including 3 newly formed States of Uttaranchal, Jharkhand & Chattisgarh) and 3 UT switch the purpose of increasing agricultural productivity and production in rainfed areas through sustainable use of natural resources.

During Eighth Five Year Plan, against a target of 28.00 lakh ha., an area of 43 lakh ha. Was developed through implementation of the project spread over in 2554 watershed with an expenditure of Rs. 971,52,00 Thousand.

During Ninth five Plan, NWDPRA has been considerably restructured with greater decentralisation and community participation, higher degree of flexibility in choice of technology and suitable institutional arrangements for ensuring long-term sustainability. Watershed Development Fund (WDF).

As follow-up action to the Union Finance Minsiter's Budget (1999-2000) Speech, a Watershed Development Fund (WDF) has since been established at NABARD with the objective of integrated watershed development in 100 priority destricts in 14 states. Now the progress indicates that 300 watersheds have been identified 8 states for WDF facility out of which 183 watersheds have been sanctioned and preliminary work relating to social mobilisation, esposure and orientation of the community and preparation for Capacity Building Phase proposals are under progress in the remaining watersheds.

Externally Aided Projects:

- Integrated Watershed Development Project (IWDP-Hills-Phase-II)
- Karnataka Watershed Development Project
- Assam Rural Infrastructure and Agriculture Suppport Project
- Diversified Agriculture Support Project (DASP)

Table 1: Comparison of Important Characteristics of Predominantly Rainfed and Irrigated Regions of India

Parameters	Rainfed Regions	Irrigated Regions	All Regions
Poverty ratio, head count, %	37	33	35
Land productivity, INR/ha	5716	8017	6867
Labor productivity. INR/ha	6842	9830	8336
Per capita consumption of food grains,	260	471	365
kg/year			
Infrastructure development index	0.30	0.40	0.35
Social development index	0.43	0.44	0.43

Table 2: Available Surplus from the Dominant Rainfed Districts/ Regions for the Important Dryland Crops of India (Based On Crop Water Balance Analysis)

Crop/ Crop group	Rainfed Area ('000 ha)	crop	Surplus runoff (ha-m)	Deficit needs (ha-m)
Rice	6,442		4123673	0
Coarse cereals (Finger millet, maize, pearl	10,656		2096125	12929
millet, sorghum)				
Oilseeds (Castor, groundnut, linseed,	10,559		2448879	134800
sesame, soybeans, sunflower)				
Pulses (Chickpeas, green gram, pigeon peas)	7,238		2071007	19116
Cotton	4,143		759143	111069
Grand total	**39,038**		**11498827**	**277914**

Table 3: Harvestable Surplus Runoff Available For Supplemental Irrigation to the Rainfed Crops in India

Crop/ Crop group	Rainfed Area ('000 ha)	crop	Surplus runoff (ha-m)	Deficit needs (ha-m)
Rice	6329		4121851	0
Coarse cereals (Finger millet, maize, pearl	7502		2057393	0
millet, sorghum)				
Oilseeds (Castor, groundnut, linseed,	6273		2421222	1646
sesame, soybeans, sunflower)				
Pulses (Chickpeas, green gram, pigeon peas)	5288		2044145	9404
Cotton	3177		757575	8848
Grand total	**28568**		**11402186**	**19898**

Table 4: Runoff Surplus Available to Meet River/ Environmental Flows After Meeting the Supplemental Irrigation Requirements of Rainfed Crops Under Normal and Drought Conditions

Crop/ Crop group	Rainfed crop Area ('000 ha)	Remaining surplus in normal season, ha-m	Remaining surplus in drought season, ha-m
Rice	6329	3489577	1428353
Coarse cereals (Finger millet, maize, pearl millet, sorghum)	7502	1319751	377150
Oilseeds (Castor, groundnut, linseed, sesame, soybeans, sunflower)	6273	1813727	658783
Pulses (Chickpeas, green gram, pigeon peas)	5288	1524096	530423
Cotton	3177	446628	113242
Grand total	**27520**	**8593778**	**3107950**

Table 5: Estimated Water Use Efficiency Values for Important Rainfed Crops in India (Based On District Level Analysis and Traditional Technology)

Crop	Water use efficiency (kg/ ha-mm)		
	Average	Maximum	Minimum
Rice	3.30	7.09	1.19
Finger millet	2.76	7.76	1.27
Pearl millet	2.37	3.90	0.61
Maize	2.34	5.51	1.36
Sorghum	1.37	2.79	0.53
Groundnut	2.57	4.014	1.33
Castor	0.72	1.04	0.33
Sesame	0.96	1.68	0.33
Soybeans	1.74	2.53	1.29
Sunflower	1.71	2.21	1.20
Chickpeas	1.74	3.28	0.81
Pigeonpeas	1.67	3.41	0.20
Cotton	0.38	1.52	0.17

Table 6: Production Potential of Rainfed Crops with Supplemental Irrigation under Normal and Drought Conditions (Business as Usual Scenario, No Change in Inputs and Management)

Crop	Rainfed cropped Area (000 ha)	Irrigable area during ('000 ha) Normal season	Irrigable area during Drought season	Additional production during normal season ('000 tons)	Additional Production during drought (000 tons)	Traditional production (000 tons)
Rice	6329	6329	6215	1405	1471	7612
Finger millet	303	266	224	51	44	271
Pearl millet	1818	1370	837	224	145	1902
Maize	2443	2251	1684	405	325	2996
Sorghum	2938	2628	1856	318	236	3131
Groundnut	1663	1096	710	183	131	1182
Castor	28	25	22	1	1	10
Sesame	1052	919	741	87	72	365
Soybeans	2843	2843	2667	330	329	2607
Sunflower	98	59	30	6	3	49
Chickpeas	3006	2925	2560	352	331	2367
Pigeonpeas	1823	1710	1374	190	171	1350
Cotton	3177	2656	1725	59	42	430
Grand Total	27520	25076	20647	3611	3301	24272

Table 7: Production Potential of Rainfed Crops with Supplemental Irrigation under Normal and Drought Conditions (With Some Improvement in Management and Inputs)

Crop	Rainfed cropped area (‘000 ha)	Irrigable area during (‘000 ha) Normal season	Drought season	Additional production during normal season (‘000 tons)	during drought (‘000 tons)	Improved production (‘000 tons)
Rice	6329	6329	6215	4141	4357	22150
Finger millet	303	266	224	124	112	757
Pearl millet	1818	1370	837	836	555	4546
Maize	2443	2251	1684	1744	1408	9772
Sorghum	2938	2628	1856	2439	1864	13139
Groundnut	1663	1096	710	284	203	2493
Castor	28	25	22	6	6	51
Sesame	1052	919	741	202	176	1051
Soybeans	2843	2843	2667	1429	1443	6254
Sunflower	98	59	30	12	7	107
Chickpeas	3006	2925	2560	1061	1000	7174
Pigeonpeas	1823	1710	1374	282	245	2186
Cotton	3177	2656	1725	294	206	3211
Grand Total	27520	25076	20647	12856	11581	72893

Conclusion

There is a further expansion of surface and groundwater irrigation fast approaching in several regions, potential rainfed areas need to be given greater thrust for meeting future food demand and ensuring food security. But agriculture in rainfed areas continue to be constrained by inadequate water availability as monsoon rains is undependable both in time and amount. Due to this constraint, a substantial part of the rainfed lands have the greatest unused potential for growth. Rainfed agriculture is mainly and negatively influenced by intermittent dry spells during the cropping season. Delay in onset of monsoon season triggers shifts to other small duration crops tailored to the remaining length of the growing season rather than overall crop failure. Intensity of dry spells at other critical stages of crop growth, specially during the flowering/ grain filling stage of the crops (even for 1 to 2 weeks), have large bearing on the potential yields at the farmer fields and several times leads to even crop failures. In order to achieve stability in yields, it is necessary to provide protective/ critical/ supplementary irrigation during these short critical periods.

To increase productivity from rainfed areas, the most potential strategy appears to harvest small part of the available runoff and reutilize it for supplemental irrigation at rainless critical crop growth stages. Available research in the country have conclusively proved that provision of limited water at the crucial stage shall be the convergence point for adoption of all other technologies and the achieve a major jump in rainfed yields. But the role of the Government is crucial in this creation. In India new watershed guidelines based on Parthasarathy Committee’s recommendations were accepted by the Central Cabinet in March, 2009. Hence the implementation has to be stepped up in order to obtain benefits in rainfed areas. National Rainfed area authority has big responsibility in matters regarding to water conservation and watershed development. It should also act according in providing supplementary irrigation during rainless areas through out the country.

Finally we conform with the 12th Five Year Plan Document of Government of India which envisages “we must also recognize that water balances for the country as a whole are of limited value since they hide the existence of areas of acute water shortage, to say nothing of problems of quality. What is required is a much more disaggregated picture, accurately reflecting the challenge faced by each region. The exact level at which regions need to be defined would depend on the purposes of the exercise, as also unifying features of the region, such as basic and aquifer boundaries.

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