Sustainable Agricultural Development in Bihar

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Introduction

Sustainable development has been defined variously. It is generally considered, as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It ascribes to a development, which is environmentally non-degrading, technically appropriate, economically viable and socially acceptable. Sustainable development has been widely accepted as a concept that must be central for future human endeavours. As evident from the above definition, this concept embodies two basic functions :

(i) Economic Development, and

(ii) Ecological Sustainability.

Both notions must be dealt with positively for any sustainable development to happen. Unfortunately, some environmentalists tend to focus on ecological issues and ignore those related to economic development and the same may be true for vice-versa. Any agricultural development project/programme is truly a sustainable one that continues to operate successfully even after withdrawal monetary and or technical support to the programme without degrading the environment. As the problem of agriculture development is *in-situ* and man made, the people of the region hold the key for its effective management.

The participation of local community is *"sin qua non"*, since the different works/activities implemented on private and common lands have to be sustained by the owner of the land in addition to maintaining collectively the works of common nature on common property resources such as water bodies, forests, grassland, etc.

This emphasizes the significance of community participation for sustainability in agricultural development programmes. We have to look for active people participation rather than the participation being only passive.

Better participation can be ensured at the later stages of the programme only by identifying and designing the programme, which is acceptable to the people and is environmentally benign. Involving a large number of farmers both male and female form the outset of the planning and development of agricultural projects coupled with substantial training ensures large-scale adoption.

What is Required for Sustainability ?

* People's participation right from pre-planning stage.
* Community empowerment including integration of women in project activities.
* Local level people's institution.
* Capacity building of the institution and its actors.
* Resource generation or capital for sustenance.
* Belief of deriving tangible benefits form development of PPRs & CPRs.
* Linkages with credit and input institutions and technical/scientific support organizations.
* Suitable withdrawal strategy.
* All these would mean integration of Social Resource Management with Natural Resource Management for achieving sustainable results given emphasis to protection/conservation, production measures and social and livelihood support activities.
* Role of project and institutional partners.

Philosophically and logically speaking sustainable development may require shift towards the following :

* Stockholders → Stakeholders
* Functional → Integrated
* Short Term → Long Term
* Reactive → Proactive
* Units → Clusters → Systems
* Efficiency → Equitable
* Cooperation as Development

Scientific research capacity to holding community participation and technology transfer can play a pivotal role in bringing about this synergism. Changes can be made that will simultaneously increase food production and enhance environmental quality. In the next 30 years, developing countries must greatly increase their food production but they must do it differently that has been the case in the past. India's population continues to rise with a growth rate of over two per cent per annum and will

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likely reach to about 1.6 billion towards the middle of next century. Our ability to meet the food, feed, fibre, fuel wood and other basic needs of the growing population is a key issue to be addressed when discussing the sustainability of our production systems.

In the past, our efforts to achieve self-sufficiency in food grains productions resulted in the required gains from both the expansion in area under cultivation and through increased productivity. Significant increases in productivity, however, were confined to relatively, well-endowed areas, i.e., regions which had very few soil or climate related constraints, and where irrigation facilities were either available or could be created easily. With the availability in mid-sixties, of high yielding, dwarf, fertilizer responsive cultivars, particularly, of rice and wheat, the main strategy was to realize the cultivars potential through increased use of chemical fertilizers and plant protection chemicals.

Mounting pressure on the natural resources due to increasing human and livestock population is responsible for greatly accelerated degradation of soil resources. Deforestation, overgrazing by livestock on private, community and State owned lands, and excessive fuel wood extraction, the primary cause of degradation, have led to substantial areas of degraded land in virtually every watershed throughout India. A continued neglect of these is a serious threat to the productivity of adjacent arable lands.

Historically, the eastern region including Bihar was the most prosperous agricultural tract of the country, and its agriculture maintained a lead over other regions. During triennium-ending 1950-51, the yield of the eastern regior was 644 kg/ha as against 390 kg/ha for western region, 554 kg/ha for southern region and 608 kg/ha for northern region. However, the introduction of input responsive new agricultural technology saw its gradual decline as the new input based technology was not compatible to its resource base and sufficient investment on infrastructure were not made to improve the compatibility and green revolution bypassed this region. Consequently, the yield of rice, the most predominant crop of the region (about 21 million ha), is now lower than the national average in almost all the States of eastern region except West Bengal. For example, the average rice productivity during 1994-95 in Bihar and Orissa was only 1,305 and 1,426 kg/ha, respectively, as compared to the national average yield of 1,921 kg/ha. Similarly, the average yield of oilseeds in eastern region (730 kg/ha) is lower than the national average yield (848 kg/ha).

The public expenditure per agricultural work which includes expenditure on agriculture and allied services, irrigation and flood control, and run electrification for the period (1969—1985) for West Bengal , Bihar and Orissa was Rs. 1,742 compared to Rs. 2,508 for western region, Rs. 1,856 for southern region, and Rs. 5,106 for northern region. Thus, the compatibility between these two could never be bridged and the green revolution bypassed the eastern region.

Bihar has specific advantages as well as handicaps. Endowed with fertile alluvial soil, enormous surface and ground water resources, congenial climate, a large labour force, and also numeric special features that confer comparative advantage. the region has a rich production resource base for intensive and diversified agriculture. It is particularly known for producing fruits like litchi and 'makhana besides mango, jackfruits, jamun, etc. and for special vegetables and spices like pointed gourd, capsicum and turmeric, etc. Perennial and seasonal water bodies abound in this region that provide a great scope for development of fishery. The untapped potential ingrained in these specified advantages need to harnessed.

For the overall development of the rural masses in Bihar, it is essential to develop other vocations like animal husbandry, poultry, bee-keeping, and mushroom cultivations, apart from agriculture, as there is large number of landless labourers in the Bihar. As per 1995-96 census Bihar produced only 5 per cent of milk, 5 per cent of egg, and 3 per cent of wool in the country, which is quite low for the large State having geographical area of 94,163 sq. km. The low milk productivity may be attributed to the poor breeds and prevalence of common cattle diseases like blood protozoan, parasites, mastitis, sterility, and skin disease, etc., the condition of milch animals. Thus, there is a need to educate the farmers to overcome these problems by adopting improved technology related to breeding of good livestock, proper feeding, health care and management.

Our present predicament calls for a new paradigm in our future approaches to research, technology development and integrated natural resource management following a participatory approach. These approaches must consider the socio-economic realities of the farming systems in different agro-ecological zones and the potentialities and limitations of the natural resources. The new approaches also must ensure a more holistic system-based view of the problems ensuring integration of conservation and production strategies. Goals of sustainability will require that technologies are generated and promoted with full involvement of the people.

Cropping Systems Management under Different Agro-ecological Situation

The climate of the region is sub-tropical, hot and humid. The Bihar plains are richly endowed with two basic natural resources—lands and water, and are most fertile plains of the country. Rainfall varies from 1,110 mm and

1,400 mm in south Bihar (alluvial plain zone) north eastern plain zone, respectively. Even though the region has rich rain, surface and ground water resources, they are grossly underutilized, with the large proportion of the cultivated area does not receive any irrigation water, and the farmers depend on the vagaries of the monsoon for crop production. During 1992-93, only 43 per cent of the net cultivated area in Bihar was irrigated as compared to 95 per cent area irrigated in Punjab. Owning to poor utilization of water resources, the cropping intensity in Bihar is low, consequently, large tracts of cultivate land during rabi season, a relatively disease free season endowed with plenty of sunshine remains fallow. As sizeable part of the cultivated area in Bihar do not have provision for assured irrigation, therefore, even short spell drought adversely affects the stability of agricultural production, thereby resulting in low productivity. Its overall effect is that the agricultural development is much below its potential; with the result, the employment in agriculture sector is limited and a large proportion of the population still remains below the poverty line and suffers from malnutrition.

The uniqueness of the ecological and the socio-economic environment of Bihar merit speed efforts towards generation of technologies relevant to the prevailing bio-physical and socio-economic environment by taking stock of dominant problems, resources and needs of the region. It would require broad-based institutional framework to address diverse issues related to land and water resources management, crop husbandry, crop improvement, horticulture, fishery, livestock and poultry, farm machine development, agro-processing and socio-economic paradigms in a holistic manner.

Sustainable Cropping Systems in Different Ecosystems

Even though the region is resource rich and supports several agricultural productions systems, it has low agricultural productivity. The State of Bihar, as per 1996-97 agricultural statistics, possessed about 7.3 per cent of the total cultivated area of the country but produced about 7.1 per cent (14.13 m tonnes) of the total food grains. The average yield of foodgrains in the State was 1,560 kg/ha as against national average of 1,601 kg/ha. Among the food-grains, rice is the major crop occupying almost the whole area during kharif; the other important crop being wheat in rabi. Area under rice and wheat in Bihar was 5.07 m ha and 2.13 m ha, respectively. The yield of rice in Bihar was 14.27 q/ha as against national average of 18.8 q/ha. Similarly, the yield of wheat was 21.68 q/ha as against the national average of 26.71 q/ha. Area under pulses has shown a decline from 1.2 m ha to 0.97 m ha (17.2 per cent). However, the yield of pulses has increased by 7 per cent and has reached a level of 8.3 q/ha as against national average of 6 q/ha. Bihar has considerable area under rice-fallows, which could be brought under rice-based cropping systems if water resources are developed for irrigation.

The sub-humid ecosystem of Bihar is predominated with the cropping systems of rice-wheat, rice-wheat-sugarcane, rice-gram, rice-lentil and rice-mustard in low lands, while in the uplands; maize-wheat, pulse-wheat and sorghum-potato-fodder are the promising ones both for rainfed and irrigated conditions. Rice-wheat is a dominant production system in the Indo-Gangetic Plain, but then, the research issues are on sustaining its productivity at high level, which would require balanced nutrient application and improved crop and water management practices. To maximize the output of the system, more intensive on-farm analysis in production constraints and development of suitable farm technology are necessary.

In the humid-ecosystem, jute-rice-rice is a dominant system. Amongst the emerging cropping systems, green manure-rice-wheat has been quite promising. In addition to this, several cropping systems like rice-rice, jute-rice and rice-rice-oat (fodder) have come up in the low lands. In the uplands, maize-green gram/black gram-rapeseed and moong bean-rapeseed have been the established. Though rice-rice system is an important production system, the productivity is low. Hence, the research issues should be on water and nutrient management and good physical condition of the soil to enhance the productivity.

Efficient Natural Resource Management

India is endowed with a rich and vast diversity of natural resources, particularly soil, water, weather, multipurpose trees and agro-biodiversity. In order to realize the potential of productions systems on a sustained basis, efficient management the potential of production systems on a sustained basis, efficient management of the resources is very crucial. With the advent of high yielding crop varieties, augmentation of irrigation facility, increased use of fertilizers, adoption of improved agronomic practices, concerted efforts of researches, planners, government, and above all of farming community, green revolution was brought about in the mid 1960's. This led to a quantum jump in food grain production form 51 Mt in 1950-51 to a record figure of 203 Mt in 2001-02. This impressive achievement has pulled the country out of the "*ship to mouth stage*" and has led it to self-sufficiency. With adoption of intensive agriculture to meet the varied growing demands for fuel, fibre, feed, fertilizer and other products in the recent years, the natural resources are, however, put under intense strain resulting in fast degradation and lowering of their production efficiency.

The demographic pressure is rapidly mounting on the natural resources. The present population of more than one billion, according for about 18 per cent of the world's population supported only on 2.4 per cent land area, is estimated to become 1.4 billion by 2025 and 1.7 billion by 2050 AD, needing annually about 380 Mt and 480 Mt food-grains, respectively. This scenario alongwith the increasing industrialization and urbanization will place tremendous strain on the shirnking resources.

Among the natural resources, soil is a finite, non-elastic and non-renewable asset. The dwindling per capita availability of land that decreased from 0.5 ha in 1950-51 to 0.15 ha in 1999-2000 because of population escalation, is likely to reduce further to 0.08 ha in 2020 AD. Approximately 80 per cent of the total farm holdings fall in the category of small and marginal with an average holding of less than one ha. Research findings have amply shown 3 to 4 times productivity potential of land even with the currently available technologies. Thus, land if properly managed shall not be a serious constraint to feed the population.

Inclusion of short-duration legumes such as green gram/black gram or green manure increases the cropping intensity. Application of only N-P-K is not adequate to sustain the high productivity of rice-wheat system. Deficiency of primary and secondary nutrients is the primary cause of yield decline. Balanced application of secondary and micronutrients is essential for sustaining high productivity of rice-wheat system.

Efficient Watershed Management : an Overview

Land and water go together and their development cannot be considered independent of each other for sustainability of rainfed areas. Conservation and management of rainwater hold key for sustainable agriculture in rainfed areas. It has also been amply demonstrated in India and elsewhere that it is impossible to envisage or implement sustainable solutions for land and water resource development and management without active and full participation of local community. Development of land and water together with sustainable production system when confined to small natural drainage unit such as watershed leads to sustainable development. Watershed Management (WSM) has, therefore, emerged as a new paradigm for planning, development and management of land, water biomass resources with a focus on social and institutional aspects from bio-physical aspects following a participatory "bottom-up" approach.

Sustainable production depends considerably upon proper development, conservation, management and use of watershed resources at micro-level. Watershed management becomes increasingly important as a system approach to improve livelihood of people while conserving and regenerating their natural resources. The role and importance of community participation in ensuring the success and sustainability of watershed management is now widely accepted.

Watershed, a hydrological unit of an area draining to a common outlet point, is recognized as an ideal unit for planning and development of land, water and vegetation resources. Watershed concept has been used extensively because for importance of water balances in the study of ecosystems. Watershed also allows accurate measurements and monitoring of components of water balance on hydrologic cycle, sediment, energy, heat, carbon and nutrients balances in a watershed ecosystem. This can provide a network of monitoring stations on sites within a basin in a nested form or otherwise to track down the status of pollutants at different points.

Tillage and Land Management for Sustainable Agriculture

Research needs for assembling knowledge about existing tillage practices in various parts of the humid tropics, synthesizing this knowledge into and expert system, and using the climatic data base in computer models to assess the long-term risk of a given tillage system on crop and soil sustainability.

Tillage refers to the manipulation of soil by an implement powered by humans, animals or machines. During tillage, soil is fractured and sometimes turned over leading to rough surface conditions. The purpose of tillage is to prepare a seedbed; break weed, insect and disease cycles; bury plant residues from the previous crop to give a neat appearance; allow incorporation of fertilizers and other amendments in soil; break the surface crust for increased water infiltration and recharge of ground water; and fracture plough pans or genetic hard pans to allow for deeper penetration of water and plant roots. Although tillage has many of the above advantage, it also has some disadvantages like the tendency to degrade soil structure, increase water and wind erosion, loss of plant nutrients with sediments, and increased evaporation.

Use of zero till seed cum fertilizer drill can advance wheat sowing by about a fortnight or more and this will promote growth and maximize yield. Under no tillage production system, grain yield was improved by 32 per cent when 60 kg/ha was banded 8-10 cm below the seed row, and 15 per cent when banded between the rows, compared to the surface broad cast of urea. Adaptation of the rows subsurface placement of N fertilizer for no-till wheat has the potential to significantly improve N availability. Research on Furrow Irrigated Raised-Beg Planting System (FIRBS) showed that this tillage technology gave an yield advantage over conventional flat bed planting method. Considering the overall performance of different tillage options it can be said that the sowing of wheat using zero till drill is highly cost effective and productive followed by reduced tillage. FIRB system with 3 rows on the bed was equally good so far as total production is concerned but it demands proper land preparations similar to the conventional system before raised beds can be made. This also means additional expenditure on fuel for seeding but saving in seed, water and nitrogen and reduction in lodging in the FIRB system, more than compensates and maximizes profits. The increase of bulk density (compaction) due to continuous use of zero tillage will adversely affect.soil edaphic environment and regular use of herbicides to kill the weeds in zero tilled field may further contaminate the ground water. It may further reduce the intake of water in the soil and cause erosion. Intermittent deep summer ploughing may alleviate the physical constraints and will arrest the deterioration of physical condition of soil. This may help in realizing the full potential of untapped natural resources. Development of eco-friendly practices for tillage and residue cycling, appropriate for specific combination of soil-agro climate-cropping systems to alleviate physical constraints with higher water and nutrient use efficiency is the need of the hour.

Assured Irrigation Through Canal

Assured and timely application of irrigation water to crops can improve agricultural production many folds. Earlier studies related to Patna canal were mainly concerned with proposal for increasing the capacity of existing canals or providing additional capacities through parallel canals. Planning of structure along the length of distributaries, minors were also done. Canal may be source of assured water supply provided there is cooperation among various Govt. departments and water users, proper estimation of availability and requirement of water, operation and maintenance plans and management strategies to cope up with various scenarios of excess or deficit water.

The traditional schedule for providing irrigation water in the canals of Bihar indicates that water is not available until 25th June. (Bihar Irrigation Commission Vol. III). However, for successful cultivation of kharif paddy, the seedling have to be raised well in advance with the support of tubewell/tank water for transplanting rice in time with the use of canal water. Ministry of Water Resources Department agreed to regulate the canal water in the middle of May, so that the water is available to the farmers for raising nursery in time.

Ground Water Potential of Bihar

Bihar State of eastern India has an area of 94,163 km^2 having with 60.5 per cent (5.696 m ha.) area under crop cultivation at 144.7 per cent crop intensity. Irrigation potential through ground water resources is 3.48 million ha area. This may cover about 61 per cent net sown area of State. Total availability of ground water resource is 3.373 million ha meter with good quality for irrigation. The total ground water potential, utilization and balance potential of Bihar for which basin-wise proper and efficient planning is needed. Total utilization envisaged through completed and on-going scheme is 1.287 million hectare metres. Only 38 per cent of ground water has been utilized. This shows scope for further development. The balance groundwater resources of 2.086 million-hectare metres have to be tapped for agricultural production.

Bihar State is rich in rain, surface and ground water resources. The average annual rainfall ranges from 1,110 mm rainfall in Bihar and north-eastern plain zone with 1,400 mm, which is sufficient to meet the agricultural water requirement. However, the water resource potential was grossly under-utilized. It was estimated that less than 20 per cent of available ground water was being exploited. Exploiting the rich ground water resource potential will be extremely helpful in alleviating poverty in the area. There are severe problems with the operation of major canal systems in Bihar that make the use of ground water as supplement to canal water extremely promising as a means to increase agricultural productivity. Furthermore, use of canal water merely for raising seedling alone will involve only a limited area, leads to wastage of valuable canal water and also jeopardizes the preparatory tillage of other fields for transplantation due to inundation. Therefore, even the farmers inside the canal commands should be given all possible incentive to develop their own tubewells/water harvesting tanks for raising seedlings and also to supplement normal irrigation in case of short supply from the canal.

Plan Panel's Tubewell Scheme for Bihar

Million Shallow Tubewell Programme (MSTP) a special scheme sanctioned by the planning commission exclusively for Bihar. Minor irrigation department of Bihar has to sink 10.26 lakh million shallow tubewells and distribute 10.26 lakh diesel pump-sets of 5 hp at a cost of Rs. 2,886.41 crore. Under the scheme, the state government received central grant of Rs. 25.50 crore. With this amount, the minor irrigation department has to sink 33,798 shallow tube wells and distribute equal number of diesel pump-sets among farmers in the calendar year of 2001-2002. Of the central grants, Rs. 25 crore have been available to the National Bank for Agriculture and Rural Development (NABARD), which is the implementing agency. Of the total expenditure earmarked for the scheme, Rs. 42.50 crores would be bank loans, while Rs. 17 crore beneficiaries share.

Planning Commission has accorded the mode of development for popularization of shallow tubewell with 30 per cent subsidy, 50 per cent loan to beneficiary and 20 per cent beneficiary contribution. All categories of farmers are eligible with preference to SC/ST for availing the subsidy and loan. Total 1.006 million shallow tubewell have been proposed with cost of Rs. 2,827.71 crore to cover 2.042 m ha land to increase 6.0 million tonnes additional foodgrain production. Unfortunately only 4,343 units out of proposed 33,798 units were achieved in 2001-2002. However, considerable improvement could be achieved in the current financial years (2002-2003) and till January, 2003 about 25,144 units were installed, which is the 44.02 per cent of the target.

The cumulative target is also revised to 57,111 units—33,798 for 2001-2002 and 23,313 for 2002-2003 by the Planning Commission of India.

Problems Due to Flooded/Flood Prone/Waterlogged Situation

In India the extent of water logging varies from 2.5 to 6 m ha depending on various sources of information and time frame. In Sone canal command though the ground water levels did not show any rising trend, yet there are isolated pockets fed by regional runoff/seepage from canals, where surface water logging is definitely a matter of concern. Still in the canal commands of Bihar, large tract is waterlogged which needs to be drained in order to evolve suitable management strategies, remedial measures and alternate plans for waterlogged areas in order to improve the productivity of land and water in participatory mode.

Bihar State lies in the Indo-Gangetic belt of Eastern India and is the 6th largest rice growing region of the world. It has diverse ecological situtations, ranging from upland to very deep water conditions, and consequently vast areas in north and south Bihar are flood-prone or flood-affected. The flooding pattern not only differs from region to region but even from locality to locality. There are thus no agricultural technologies, which are universally adaptable for the whole region.. A cluster of four representative villages near the embankment of the Burhi Gandak River in north Bihar was subjected to agro-ecological anaysis. Four types of lands were categorized namely, (i) upland, (ii) midland, (iii) low-land and (iv) deep water on the basis of water depth and period of stagnation during the wet season. This is primarily due to the contour of the land, and is generally valid for most of the area. Upland and midland constituted 15—20 per cent of the total cultivable area, while the rest was flood-prone.

Flooded and Flood-Prone Lands

(A) Tal Land.—Tal land is termed as the stretch of land having bowl/saucer shaped naturally created depression inducted in kharif season due to spill/overflow from rivers or runoff form upstream end. The magnitude of the problem may be gauged from the fact that the total area in Bihar under Tal area is about 1,034 sq. km. with a length of 105 km. The natural topography of Tal area is such that rain water of 1,150 sq. miles area is accumulated in this area and the accumulation of water goes upto a depth of 14 feet. Of the total water accumulated in Tal area, 40 per cent goes to Ganga and the rest 60 per cent remains in the Tal upto October. In such areas it is not possible to raise kharif crops. Since the soils became bone-dry during summer and remained inundated during rains, only mono-cropping (like lentil, gram, pea, rai, etc.) during rabi season is almost a rule.

(B) Diara Land.—They are situated in between the natural levees that get inundated for different periods of time and are periodically eroded and formed due to meandering, braiding and course changing of rivers. In simple terms, these are lands on the bank of rivers, which are subjected or prone to flooding during monsoon. Depositions of fresh soil during floods take place in Diaras. Irrigation facility is very limited and about 90 per cent area is unirrigated. The total area in Bihar, under Diara is about 11.59 lakh hectares. Diara land grew two crops generally, one rabi another summer, but the production of both crops is poor.

(C) Chaurs.—A large tract of land in north Bihar remains waterlogged for a variable period of time in a year and represents a fragile and unstable eco-system. Depth and duration of wetness vary in different areas. About 4 lakh hectares are under chaur lands with varying depths of water for varying periods of the year. Alternative ferming systems with suitable cropping pattern will have to be developed. In these lands, crops like makhana, singhanra and fisheries may be developed and income of the area would increase.

Productivity Constraints

The major resource constraints to agricultural production in Bihar are : (i) inadequate and unreliable surface irrigation system; (ii) meagre utilization of ground water resources; (iii) inadequate implementation of soil and water conservation measures; (iv) excess water during kharif creating unfavourable edaphic environment for plant growth; and (v) low level of fertilizer input; (vi) lack of assured irrigations facilities, (vii) suitable crops cultivars, (viii) soil-testing facilities for balanced fertilization; (ix) appropriate farm power and machinery, and (x) infrastructure development for marketing, (xi) under employing of labour forces in agriculture and high incidence of poverty; (xii) smallness and fragmented nature of farm holdings couple with inequitable agrarian structure; (xiii) lack of facilities for storage, processing, value addition a marketing of agricultural products; and most importantly the ecological handicaps incidental to water congestion and flooding which restrain farmers from making high investment for modernized agriculture.

In additions, the farmers complain about the timely availability by frequent floods arising from overflowing of rivers originating from Nepal, and heavy monsoon rains. The delayed recession of flood water and late rains during October result in excess soil moisture that considerably delays the sowing of rabi crops. In the past, recognizing the urgency of ensuring food security of the country, priority attention been consciously given to the high response zones of the country. There is now a similar urgency to attention to the Bihar whose high rainfall plains hold the promise of ushering in another Green Revolution and enhancing economic prosperity of the country. A high priority also needs to be accorded the development of agriculture so as to remove regional imbalance and more importantly to tackle the series social and political problems arising from poverty and unemployment in the region.

Gap in Rice Yield in Different States of Eastern Region

The State average rice yield ranges from 18.11 q/ha (Bihar) to 31.47 q/ha (West Bengal). The yield difference between State average and yield obtained in experimental trails ranges between 1,856 kg/ha (West Bengal) and 4,717 kg/ha (eastern U.P.). Thus there is a considerable scope in enhancing the productivity in Bihar especially of rice. It is possible only by taking major research initiatives and transfer of technology to the farmer's field through extension and other support.

Gap in Fruits and Vegetables Production of Eastern States

Eastern region including Bihar has an excellent climate, soil and water availability conditions and specialized work force for the year round intensive cultivation of vegetable crops. Flood plains provide very good conditions for the cultivation of rainfed melons and gourd vegetables. Special vegetables like parwal, potatoes, leafy vegetables, colocassias, etc. produce excellent and bumper yield when proper varieties and cultivation practices are followed. Besides vegetables, spices like turmeric, chilies, ginger, etc. are grown successfully either as pure or inter-crops for achieving higher cropping intensity.

Studies made at different horticultural research stations with improved trees and practices have shown that it is quite possible to enhance the fruit yields up to 20m t/ha. This area has very good climate and soils for the elite fruits like mangoes, litchi, jackfruits, jamun, banana, pineapple, bel, makhana and several other region specific fruits.

Gap in Fish Yields in Different States of Eastern India

The eastern region is endowed large inland water bodies inclusive of rivers, lakes, tals, beels, chaurs and medium to high rainfall to sustain intensive fish culture. It is estimated that about 0.9 m ha (5.2 per cent) of total cultivable area of north Bihar suffers from the problem of water logging due to flat topography and lack of adequate drainage. A substantial portion comprises of water bodies in which fish culture will be a highly remunerative enterprise for the livelihood of the farmers. The central and southern Bihar also has large number of ponds, reservoirs, and low land that are suitable for fish farming. Presently the productivity of fish from the water bodies is quite low in Bihar, with the result, the State is able to produce only 9.3 per cent of total inland fish production of the country. Such a wide gap in productivity could be narrowed down only through major initiatives in research and technology development. In order to increase productivity of water bodies, there is a need to develop and transfer fish production technology among the fish farmers through training and education on breeding and feeding of the fish. The adoption of improved technology would not only generate more employment, but would also increase the availability of cheap animal protein in rural areas.

Contribution of Bihar for Second Green Revolution

In the past, recognizing the urgency of ensuring food security of the country, priority attention had been consciously paid to relatively high-response zone of the country. However, despite all sincere efforts from all quarters, plateauing syndrome of agricultural productivity in recent years suggest that the potential of these zones has already been exploited, and there seems to be hardly any scope of furthering agricultural productivity in these regions. Unless some thing concrete in terms of research and extension is done, food security of the country may gradually be jeopardized in the wake of our vast population growing at the alarming rate. Therefore, there is now a similar urgency to pay attention to eastern region specially Bihar, whose high rainfall plains hold the promise of ushering in another green revolution by tapping the enormous natural resources and enhancing economic prosperity of the country. Despite richness of natural resources and various comparative advantages, agricultural development of the region is handicapped due to biophysical, socio-economic and technological constraints.