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Sustainability of Agricultural Development in Jhabua District of Madhya Pradesh

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SUSTAINABILITY OF AGRICULTURE DEVELOPMENT IN JHABUA DISTRICT OF MADHYA PRADESH

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SUMMARY REPORT

of

Research under Ph. D Programme

Entitled

SUSTAINABILITY OF AGRICULTURE DEVELOPMENT IN JHABUA DISTRICT OF MADHYA PRADESH

1. Introduction

1.1 Introduction of the Topic

The agriculture in India has come under serious environmental and socio-economic conflicts, primarily resulting from the imbalances in planning strategy with the sole goal of modernization through industrialization. The neglect of agriculture and the efforts of modernization of the national economies have posed serious problems to agricultural ecosystem and its sustainable growth due to increasing environmental conflicts and serious socio-economic insecurities in underdeveloped but resource rich tribal regions. The modernisational approach to development has degraded environment and resulted in ecological insecurities in tribal and mountainous regions.

The sustainability of agriculture depends largely upon the specific agro-ecosystem types and the institutional conditions which may be largely explained by the population and the communities' socio-cultural conditions, agrarian relation and the policy and planning of the Government. The colonial and post-colonial policies of modernization of the national agricultural economies without understanding the socio-ecologic relations of the agriculture regions resulted in serious eco-regional problems of agricultural development. On the one hand, the continued deforestation due to mining and quarrying and commercial use of forest resulted in serious environmental and ecological conflicts in the tribal regions, it posed serious socio-economic and agricultural ecosystem conflicts despite the policy of modernization of agriculture through transfer of modern technology.

Sustainability of agriculture may be examined in terms of economic and ecological sustainability of the agriculture system at any point of time by identifying the indicators which may bring about sustainable growth of agricultural economies in the tribal areas.

The current literatures on agricultural development are focusing more on increasing food production, increasing the carrying capacity of the agriculture and maximization of employment and income in the agricultural systems.

The agriculture practices in tribal areas have increased as a result of socio-economic adaptation of tribes from traditional pastoral economy to organized farm economy and largely influenced by institutional condition due to the policies of conservation of forest and denial of traditional rights to the tribes. Therefore, the basic issues of the concern in the tribal areas are to plan for the traditional economies like forestry, animal husbandry in agriculture, so that, the objective of ecosystem restoration and the carrying capacities of agro-economic-ecologic zones are enhanced. The Government of India after institutional reform of Panchyati raj system has initiated peoples' participation in the developmental activities along with allowing the market economy to operate through the privatization policies, so that the exogenous demands for rural products are increased. However, these policies are not effective enough due to the constrained supply of agricultural products due to low level of productivity and socio-economic and environmental conflicts in the agricultural regions.

The decentralized planning process to restore the socio-economic development and develop sustainable regional economic base requires the sustainability of growth of subsystem of agricultural system including environmental, ecological, socio-economic and economic.

It is hypothesized that the decentralized development policies for agricultural development are largely oriented to transfer of technology and extension of credits etc. without focusing on agro-ecosystem stability and growth. The continuation of modernisational policy has resulted in increased agricultural production in selected areas, but there is increasing and serious problems of marginalization of farms and their productivity. Moreover, as a result of

increasing population pressure on land, the forest cover, grazing lands and forest areas are fast degrading due to extensive agriculture practices with low productivity. The major issue is to increase the farm productivity by increasing the resource use efficiencies combined with transfer of modern technology and diversify employment in ecological diversification of agricultural cropping pattern.

1.2 Identification of the Research Problem

- (i) Tribal areas are facing serious environmental and ecological conflicts resulting in serious instability and unsustainability of the agricultural system. This has seriously affected the livelihood condition and created food insecurity, which needs to be studied with the objective of restoration of ecological sustainability of the agricultural system. The impacts of the environmental changes on land use pattern, degradation of resources, cropping pattern and crop productivity and resource use efficiencies are required to be analysed in system dynamic framework.
- (ii) The Govt. of India is continuing with development and transfer of technology and extension services along with many programmes for maximization of agricultural production and productivity. The study of the pattern of impacts on different cropping systems and activity zones like agro-forestry, horticulture and animal husbandry is required to identify the pattern of bio-productive systems in identified activity zones. The impacts of Govt. policies on conservation and development of resources and crop combination and productivity patterns are need to be examined at the levels of resource use, cropping system and marketing in spatial and temporal framework.
- (iii) The anthropogenic impacts resulting due to centralized forestry and mining activities have resulted in local and regional ecosystem and environmental degradations. The tribes now have negligible ecologic and economic sustenance from forestry and in majority are dependent upon agriculture. It is necessary to examine how the tribes are having access to the common property resources under the condition of Govt. and private sector interest.

The changed socio-economic policies after the institutional reform of Panchayati raj aimed at peoples' participation in conservation and development programmes in forestry, animal husbandry, horticulture etc. have impacts on the resource base and developmental activities which are required to be examined in the study region. The temporal variation in the horizontal and vertical mobility of labour and diversification of production and productivity pattern analysis along with local and regional specialization in the productive systems would be necessary to evaluate the sustainability of agricultural development.

- (iv) The traditional regional economies had horizontal ecological and economic exchanges between the different activities of primary sector like agriculture, animal husbandry and forestry with effective peoples' participation. Due to the centralized modernisational policy through industrialization, the local resources have vertically integrated under centralized control, particularly forest and minerals resources. This has resulted in the environmental and ecological conflicts and constrained the growth of agriculture and the vertical integration of the agricultural economies. The farmers are using income maximization strategy to pay for having access to modern development expenditures like education, health etc. It is necessary to examine the impacts of market orientation of agriculture on production, income access to basic consumption, assets and developmental investments at micro and macro economic system.

1.3 The Objective of Proposed Research

- (i) Structural analysis of the agricultural ecosystem in the region to analyse its present sustainability.
- (ii) Identification of the variation in the indicators of agriculture ecosystem to identify the sustainability of agriculture growth.
- (iii) Identify the sustainable growth and constraining indicators in the study areas for selecting the policy variable.

1.4 Methodology and Techniques Used

- (i) Selection of structural and growth indicators for evaluation of sustainability of agricultural development for the socio-ecological, environmental, agricultural and infrastructural indicators.
- (ii) The collection of secondary data and information for time series and spatial analysis for identify the prospective and problematic regions.
- (iii) Selection of sample study areas from the problematic and prospective regions and farming zones in geographical landscape framework from the different activity zones.
- (iv) Identification of the priorities of development on the basis of the analysis using factor analysis technique and using composite indices for identifying regional and temporal analysis of the indicators. The priorities of development have also been analysed at the micro level.
- (v) Identification of priorities and strategies for sustainability of agro-ecosystem and growth by selecting instrumental and control indicators from the analysis.

1.5 Identification of Indicators and Variables

The following indicators have been used for the analysis of agricultural sustainability in the study.

- (1) Dependent variables $[y]_{j=1}^m$ where $j=1, \dots, m$ is number of regions.

- (2) **Demographic indicators $I_1 = [X_{1i}]_{i=1, 2, 3, \dots, 6}$**

X_{11} = Percentage of tribal population to total population

X_{12} = Density of population

X_{13} = Level of rural literacy

X_{14} = Percentage of cultivators in the main workers

X_{15} = Percentage of agricultural labourers to main workers

X_{16} = Percentage of urban population to total population

- (3) **Infrastructural Indicators $I_2 = [X_{2i}]_{i=1, 2, 3, \dots, 8}$**
- X_{21} = Percentage of area under irrigation
 - X_{22} = Number of tractors used per 1000 cultivated area
 - X_{23} = Percentage of cultivated area under HYV
 - X_{24} = Fertilizer used per unit of cultivated area
 - X_{25} = Area served per regulated market
 - X_{26} = Percentage of villages connected by Pucca roads.
 - X_{27} = Agricultural credit advanced per unit of cultivated area
 - X_{28} = Electricity consumed per unit of cultivated area
- (4) **Ecological Indicators $I_3 = [X_{3i}]_{i=1, 2, 3}$**
- X_{31} = Average landholding
 - X_{32} = Per capita food production
 - X_{33} = Dependent population per hectare of cultivated area
- (5) **Environmental Indicators $I_4 = [X_{4i}]_{i=1, 2, \dots, 5}$**
- X_{41} = Average annual rainfall
 - X_{42} = Percentage of wasteland to GA
 - X_{43} = Percentage of fallow land to cultivable area
 - X_{44} = Percentage of pasture land to GA
 - X_{45} = Percentage of forest area to GA

1.6 Scope and Limitations

- (1) The study will focus on the ecologic and economic sustainability of the agricultural system in the tribal area because there is high level of environmental and ecological risks of the agro-ecosystem in tribal areas which has resulted due to the centralized forest and mining policies during colonial and post colonial periods
- (2) The study aims at identification of the indicators of growth and constraining indicators and variable in the study area for selecting a set of policy

variables for sustainable ecological and economic growth strategies in the study area.

- (3) Since, agro-ecosystem is composed of human population, natural resources and agricultural practices and economy, the relational variables and indicators have been used to identify population and social ecological and economic relations, farm ecology and economy in relation to resource use efficiencies and the agricultural economy and its economic relations with the market.
- (4) Though, the literatures on study of agricultural sustainability have largely been applied in scientific and economic studies, however, they are largely partial analysis. In economic literature, sustainability have related to partial levels at the resource use, production, market, socio-economic levels only. The agro-ecosystem studies, in majority, are scientific and do not explain its relationship with the economy. The proposed research is an effort to develop an ecological-economic system analysis with the help of factor analysis technique for the macro agricultural system and micro system level behavioral analysis.
- (5) Though, the study attempts to identify ecological and economic system viability in dynamic regional framework, it has limitations and scope for further detailed research on institutional and functional studies of forestry based bio-production cycle and system, along with the growth of allied activities of agriculture like horticulture, animal husbandry and agro-forestry and their production cycles and system growth.

2. SUMMARY AND CONCLUSION

2.1 Salient Features of the Study Area

The study area is part of the Vindhyan hill ranges and Malwa plateau. The Malwa plateau region is relatively good for cultivation but interspersed by hills. The part of Mahanadi basin has many tributaries joining Mahanadi river and the basin has the alluvium soil. The increasing tribal population, on the one hand, has resulted in extensive agricultural practices and in the degradation of forest cover and grazing lands. The region is facing serious problems of climatic changes and faced severe drought condition in recent years. This has resulted in eco-system imbalances in agriculture resulting to food insecurity, unemployment and migration. The infrastructural facilities like irrigation are limited to selected areas and the majority of the land is unirrigated. Petlabad tahsil, which is relatively developed in agriculture, also faces the problem of agro-ecosystem instability due to the lack of the capacities for water conservation and development. The Alirajpur tahsil is problematic area, where facilities are least developed. Unless the agro-ecosystem is strengthened with proper irrigation facilities, the development process in the region will be constrained.

2.2 Identification of the Problems of Sustainable Development

2.2.1 The Demographic Problems in Agro-ecosystem

The demographic condition explains that the pressure of population on land is increasing with increasing population, however, environmental risks and economic uncertainty and lack of irrigation facilities has kept agriculture subsistent leading to food insecurity, unemployment, poverty etc. The death rate is very high particularly among infants, however, it is decreasing with increasing access to health care facilities. The literacy levels among tribes and women are very low due to the lack of disposable income and economic uncertainties. This has also constrained the vertical occupational mobility of tribes in non-farm

modern economic and service activities. There is faster marginalisation of workers and there is decline in the percentage of main workers in the occupational structure in the study area. This problem has resulted not so much because of population pressure, but rather due to the lack of economic growth and employment generation in the study area. The regional economy is backward and has unstable carrying capacity leading to unemployment, poverty and migration. Per capita landholding is decreasing, there are substantial numbers of houseless population in the region, which pose serious demographic problems and require attention of the policy makers.

2.2.2 Infrastructural Development Problems

The low levels of infrastructural development have been indicated by the lack of physical, economic and social infrastructural facilities in the region. The economy is subsistent and largely agrarian and has serious environmental risk and uncertainty due to drought. It is necessary, therefore to augment irrigation facilities. The major source of irrigation is by wells and tubewells. Under the condition of drought, the water table of wells and tubewells goes down and results in failure of many wells and tubewells. It is necessary to create water balance in Jhabua district and also Malwa region through conservation of water through stopdams, tanks and rainwater harvesting on a massive scale. It is found that in the areas where irrigation intensity increases, the modern technology is transferred resulting in higher level of productivity. It is necessary therefore to increase the irrigation capacity, so that the modern technologies are transferred in the agriculture in the region. This will help not only in transfer of modern technology, but also help conservation and development of resources like land, animal, forest etc. through ecological-economic cycles in different activity zones in the geographical landscape.

The other infrastructural facilities also have a constrained growth due to the lack of demand under the condition of economic non-viability of the system and the lack of disposable income to have access to education, health, credit and other facilities. The transfer of technology has a trickling down effects to the

relatively larger farms and higher income and asset classes. Though, an attempt is being made to increase the access to education by ensuring mid-day meals to school going children, with the objectives of social and human development, it has negligible impact on modernisation of regional economy as indicated by a negligible share of non-farm tribal occupational share in modern activities.

2.2.3 Agro-ecological Problems

The agro-ecological problems may be categorised in two parts - (1). The decreasing access of the population and communities to the resources in the agricultural system and (2) The deterioration of the conditions of the farm-ecosystems due to the imbalances in the ecosystems and the agricultural productivity. These problems have been studied at two levels, firstly, at the macro-ecologic-economic systems at the district, tahsil levels and the micro ecologic- economic systems at village and activity zones levels in prospective and problematic regions. It is generally found that the fragmentation and consolidation of holding is continuing and access to the resources both natural, financial and technological to the small farms are decreasing in both the regions, particularly in Alirajpur tahsil. It is generally found that privatisation of capital, infrastructure and technology is increasing under privatization policies. The access to resources and infrastructure is not being developed as public good or common property but rather private property, further leading to growing inaccessibility to larger number of marginal and small farms.

The agriculture farms under the influence of market are fast adopting modern and specialised cash crops as an income maximisation strategy, which has resulted in susceptibility of crops failures under the condition of environmental changes and neglect of traditional inferior food crops like Bajra, Kodo-kutki etc. This has resulted in increasing food insecurity to a large number population in the region. There is a growing tendency of increasing animal husbandry and horticulture in the agricultural system as an ecological cycle and ecological succession process. On the other hand, in the forestry zone of Alirajpur tahsil employment and income is increasing. The increasing agro-forestry and

horticulture may result in ecological association of forestry and horticulture with agriculture. The respondents and communities' representatives in the sample villages of Petlabad and Alirajpur tahsils identified that though the farming activities, land and water conservation has increased, the irrigation facilities and the electricity supply are insufficient. The poverty and unemployment is increasing as indicated by the occupational pattern and marginalisation in the employment in the study area. The tribes are the main sufferer in the district. With the increasing population, the carrying capacity of agriculture is not increasing, resulting in unemployment and poverty and inaccessibility to common property resources to majority of the population. The respondents found the conservation and development of land, water and forest insufficient and economic development contrained. The farm ecosystem has degraded due to environmental problems like drought , soil erosion, increasing wastelands etc and the lack of irrigation facilities. The contrained development of agriculture has resulted in increasing incapacities for economic and ecological diversification of rural economy through animal husbandry, horticulture and forestry. The development of horticulture and animal husbandry is taking place in selected areas, where restoration of farm ecosystem is increasing resulting in the increasing resource use efficiencies and farm productivity. Moreover, the increase in the irrigation results in the transfer of agriculture technologies.

2.2.4 The Environmental Problems

The study region has a serious problem of drought, deforestation, soil erosion and increasing wasteland. The problems though have a regional and global dimensions of climate change, the degradation of forest and land are primarily due to increasing pressure on land for extensive agriculture for livelihood security resulting in deforestation and wasteland generation. Though, it is difficult to attribute the environmental degradation to the anthropogenic pressure on resource, it has a serious short-term eco-degradation and livelihood insecurities in the agro-ecosystems.

2.3 Indicators of Agro-ecological Development

The regional eco-systems may broadly be classified as forest ecosystem and agro-ecosystem. The urban ecosystem has resulted as the anthropogenic impacts influencing the regional ecosystem. The forest ecosystem no longer supports the local communities for their ecologic-economic security. The majority of the tribal population depends on agro-ecosystems. The agro-ecodevelopment and its economic productivity would require the conservation and development of physical and ecological resources (like water, land, forestry, horticulture, animal husbandry etc.) as well as subsystem level balance and growth and ecologic-economic integration of the subsystem. The regression coefficients indicate that the agriculture production is negatively influenced by the demographic, ecological and environmental factors. The percentage of agricultural labourers to main workers, level of rural literacy, percentage of urban population to total population and the density of population have contributed more in the demographic indicators during 1990-91. By 2001, the percentage of agricultural labourers to main workers, rural literacy and percentage of tribal population has contributed in the demographic indicators. In the infrastructural indicators, the percentage of area under irrigation, number of tractors used per thousand cultivated area, fertilizer used per unit cultivated land and percentage of area under HYV have contributed the higher in the composite score of infrastructural sector by 1990-91. By 2004-05, the contribution of agricultural credit along with percentage of area under irrigation and percent of area under HYV have crucial role and contributed the highest. It means that the modern technologies and extension activities have closer relation with irrigation and contribution to the composite score of infrastructure resulting in conservation and development of agriculture ecosystem and modernization of the economy.

The ecological variables like per worker dependent population have contributed the highest, followed by per capita food production and average land holding during 1990-91. By 2000-01, however, the average landholding and per capita food production contributed the highest. It seems that landholding and per

capita food production have become more important than dependency ratio and growing importance of agriculture productivity in the region.

The environmental factors like percentage of cultivable waste lands, average rainfall and percentage of forest areas to geographical area contributed the highest in the environmental indicators. By 2001, the percentage of cultivable wastelands and the percentage of revenue forest areas to geographical area had the highest contribution in the environmental indicators. This indicates the growing importance of forest and land in the agro-ecological system.

2.3.1 Infrastructural Indicators to Agro-ecologic Development

The farm employment and rural literacy were the two important instrumental indicators which contributed the highest in the demographic indicators. Among the infrastructural indicators, irrigated land, agricultural credits and use of HYV were significant infrastructural indicators. Among the ecological indicators, farm employment, per capita food production was the important instrumental indicators of development. In the environmental indicators, conservation of waste land, forest were indicated as instrumental indicators.

2.3.2 Structural Indicators of Sustainable Development

The sustainable development is constrained by the demographic, ecological and environmental indicators. The ecosystem structure in agriculture could be restored by water and forest conservation, which could involve the eco-regeneration and development through conservation of the resources in the ecosystem and result in ecologic and economic diversification and higher level of productivity through transfer of technology. It was found from the analysis that the tribal population which depended in majority on agricultural activities may have more access to employment, income and access to common property resources only if the access to resources and employment and income is assured through agro-eco-diversification through conservation of physical and ecological resources. An extensive agriculture ecosystem has developed with low productivity and higher environmental and ecological risks. The intensification of

agriculture would require the conservation and development of resources particularly water to start with which will help in eco-restoration and higher level of productivity through transfer of technologies.

2.3.3 Contribution of Control Indicators for Sustainable Development

The agro-ecosystems in Jhabua district indicate an extensive deforestation resulting in increasing wasteland and decreasing pastureland. It is necessary to control the deforestation and wasteland generation in the agro-ecosystem of the tribal region. The recurring drought conditions have resulted in unsustainability of agro-ecosystem and out-migration of tribes for livelihood security in adjoining areas. Though, the government of India has developed employment guarantee scheme for rural labour and self-help groups for income and employment generation, these efforts are marginal and subsidiary in the nature. A growth model which would require increasing efficiencies in resource use and the economy which would result in economic and social development with multiplier effects in the agro-ecosystem. The lack of development of agro-ecosystem and their unintegrated programming has resulted in serious socio-economic inequalities resulting from fragmentation of landholding and unbalanced access to resources. The tribes are finding difficult to compete with the anthropogenic forces and anthropogenic conflicts have started in many of the tribal regions. It is necessary to expand the economic base of the tribal region for having increased access to resources under the competing stakeholders of private interests and the government.

2.4 Strategic Approach to Sustainable Development of Agriculture in Jhabua District

The government of India has adopted decentralised development and planning process with a view to social, sectoral and regional decentralisation of development process by introducing Panchayati-raj system for effective peoples' participation. Many of the environmental and social development process are continuing as programmes for social and economic development of the

communities along with sectoral development plans with a view to social and economic capacity building. Many of the programmes are long term, which have hardly been effective enough due to the stagnation of economic growth and integration of the communities to the growth process. This has raised issues of access of the communities to employment, food, gainful income and access to common property resources. Many of the models of sectoral development programmes in agriculture, mining, forestry and industries etc have negligible linkages with the local communities. The basic issue therefore is to develop community based economic system and integrates the communities to the secondary and tertiary economic cycle for grass-root approach to regional development under the condition of globalisation and privatisation policy. The modernisation impact is resulting in increasing vertical linkages of raw materials and primary productive activities rather than the traditional horizontal, ecological and functional linkages. This has posed a serious eco-regional degradation and insecurity to livelihood to a large number of traditional rural communities. The regional development in geographical landscape requires conservation of resources so that to restore the imbalances in the eco-system and evolve eco-regeneration process in bio-productive system for not only ensuring the access to resources to the local communities but also for meeting the demand of exogenous market.

There are serious sectoral imbalances and regional disparities and socio-economic development pattern. The decentralised development programmes at regional, sectoral and community levels are not properly integrated at the local and regional levels because of institutional conflicts. There is multiplicity of programmes, which are not properly integrated at regional, sectoral and community levels. It is necessary to identify the priorities of development for growth and balance of the economic and social systems. The eco-regional development model in India in general would require eco-restoration and development is geographical landscape by conservation and development of mountainous tribal regions, plain and sea basins. The large-scale displacement of the local people with private and public intervention without ensuring regional

level ecosystem balance has resulted in dichotomous and dysfunctional. The eco-restoration would require bio-productive regeneration and growth in the geographical landscape.

The most of the programmes related to conservation of development of resources have not been effective enough due to lack of participation of the people. Majority of the farmers in Alirajpur tahsil responded that though farmlands have increased, efficiency of water conservation has not increased. Similarly forest conservation programmes have not effective. Similarly, the infrastructure of facilities like education, health, irrigation, electricity supply and housing are inadequate.

The employment opportunities have not increased and employment and income generation programmes are insufficient in the study region. Though, the literacy among women and weaker section has increased. The skill in youth has not increased. Majority of the respondents of the community representative found self- help groups programme has not increased and there is no new economic and social development work started by village communities. In terms of empowerment, though weaker sections in the villages have been socially and politically empowered. The economic empowerment is not there. In Petlabad tahsil, the farmers' economic efficiency has increased however, in Alirajpur tahsil it has not increased. Similarly, there is reduction on in poverty in Petlabad tahsil, it has not decreased in Alirajpur tahsil. The access to health facilities has not empowered in both the tahsils.

The above analysis indicates to the failure of the majority of the conservation and development programmes in having access to the needy community target groups in different regions at different levels of development. The problem lies in decentralisation of development without recognition and identification of local level priorities of development. Many of the programmes like subsidies directed for ensuring sustenance of livelihood without identification of local and regional level of growth and development strategies. The exogenous and centralised decentralisations of development programmes eventually are not

able to create balance, equity and growth in the different sub-systems of eco-regional system.

2.4.1 Priorities of Development

The development has been analysed at macro ecosystem and micro ecosystem in the study area at district, tahsil, activity zone and village levels. The development at the regional levels is identified as sectoral development programmes directed at resource conservation and development and development of social and economic sectors. The sectoral structure has been pursued in Hirschmanian model of structure, infrastructure and superstructure framework. The infrastructural, agricultural and industry sectors have been identified as the sectors of development at regional levels to indicate the levels and growth pattern. It is found that there is an inter-sectoral and intra-sectoral gap in the levels and growth of sectors. It is found that conservation of water is one of the most important eco-conserving and development including infrastructural activity in the study area, which not only ensures sustainability of agriculture activity but also ensures increased productivity through absorption of modern technology. Similarly, the higher productivity in agriculture leads to increase per capita income and access to literacy and employment generation. The influence of market for high yielding varieties and cash crops though has increased in the region, it is constraint by fluctuation in rainfall and lack of irrigation facility. Increasing higher productivity of agriculture may help not only micro-level farm level productivity and socio-economic development ensure increase supply to provide a threshold industrial growth based on agricultural forestry and other productive systems.

A very high level of dependency on agriculture has not only degraded the local resources but also has resulted in unemployment and poverty. The occupational mobility of the workers is limited to the non-farm activities. A community based co-operative development programmes around animal husbandry and forestry horticulture would help in not only conservation of the

biotic resources but also initiate development in non-farm processing activities in the region.

2.4.2 Strategic Approach to Sustainable Development

The basic aim of sustainable development is to evolve an eco-regenerative production cycle in which the conservation and development is integrated in ecologic-economic relations. Since, the agricultural system is extensive and subsistent, it is necessary to intensify the production and productivity. Since, the growth of irrigation is highly correlated with technology transfer, it is necessary to conserve water resources and develop irrigation system which will not only ensure bio-productive regeneration, but would also influence absorption / transfer of modern technology for higher level productivity. It is also observed that higher farm productivity has an impact on conservation and development of animal husbandry and agriculture in the agro-ecosystem.

A very large tract of lands, which were brought under subsistent agriculture has been abandoned and are wasteland in slopes and other areas. It is necessary to identify geo-ecologic suitability of land under forestry, horticulture and animal husbandry by initiating eco-regional planning in different geo-economic zones.

The agro-processing, forestry, horticulture, development policies are required to be integrate with the local communities for their economic empowerment and regional capacity development. For this, the communities engaged in different primary and secondary activities need to be identified and farm producers' cooperative around different production process to evolve a regional production cycle around different types of primary products and their demand potential in local, regional and global markets. This will ensure an eco-regenerative production cycle and regional production systems in Panchayat – raj institutional framework.

2.4.3 General Policy Recommendations for Agricultural Development in Tribal Regions

- (i) Due to the centralised control of forest and mineral resources in colonial and post-colonial periods, the tribes have lost their ecological and economic rights in the forest habitat. As a result, they have adapted to agriculture in majority. It is necessary to develop agro-forestry and horticulture through proper market linkages for diversification of employment and income as well as restoration of regional ecological balance.
- (ii) As a result of increasing population, the subsistent extensive agricultural practices have increased in tribal areas with low level of food production and food availability and serious environmental and infrastructural insecurities. It is found that in selected areas where irrigation system has developed, the agriculture intensification is increasing and modern technology is being adapted by the farmers, whereas, due to the lack of irrigation infrastructure and environmental risks, a larger lands brought under agriculture have been abandoned by the cultivators in the fringe areas. An integrated resource use policy for efficient utilization of resources and planned diversified cropping pattern with agro-forestry and horticulture is required to be promoted and inter-linked to the agro-processing activities and market linkages.
- (iii) With the increasing population and decreasing carrying capacity of agriculture, the tribes are migrating to the other relatively agriculturally developed region. However, a serious problem of unemployment and poverty exists in such regions. Though, Government of India has initiated employment guarantee scheme for land less labour, it is necessary to develop institutional mechanism such as economic cooperatives for organized rural industrial development based on the resources.
- (iv) The Government of India in Panchayati-raj system is trying to increase community participation in the development process. However, these policies though have increased the political participation in Panchayats and community development programmes, the participation of the tribes in the social and economic development is still a dream. It is necessary that local and

regional level policies are adopted for effective participation of the tribes in economic and social development in grass-root approach.

- (v) The market forces are influencing the agricultural cropping pattern in the tribal area, and farmers being influenced by market prices are tending to adopt cash crop production as income maximization strategy. However, food production and food availability is still seriously constrained. It is necessary to maximize food production in view of the serious food insecurity condition and have integrated maximization of income strategy in farm and non-farm activities.
- (vi) The anthropogenic pressure is increasing through forestry, mining and other urban based activities. Under the condition of centralized forest and mineral resource policies, the tribes are losing stakes to the local resources and economic access to the employment and income in modern urbanized activities due to their social backwardness. It is required that policies for participation of the tribes to have access to the common property resources in the tribal areas is increased to offset the negative impact of anthropogenic forces of privatization and globalization and ensuring the stakes of the tribal communities in the changed institutional reform and economic policies. It is necessary to effectively develop community based development strategy for faster development and integration of the community in the development process.
- (vii) The tribal regions are resource regions having rich biotic and mineral resources. With the help of resource based planning, a grass-root approach to economic and social development may be initiated so as to maximize employment and income of the tribes as well as provide surplus for the market for secondary and tertiary level processing. The institutional rigidities are constraining the efficient use of resources and development of resource based production cycles and regional production systems.