

## Integrated Approach for Sustainable Agricultural Development : A Case Study

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### 1. Introduction

The agriculture in recent years has shown a spectacular sign of food sufficiency and self-reliance. The combined forces of population growth and land degradation have threatened to destroy the land and water resources which are assets to any agro-ecological set-up. The area under forest is dwindling. The farm land is being diverted gradually to non-farm uses. The possibility of getting additional land under cultivation is very remote. This stresses a need to produce more and more foodgrains from less and less land and water in coming years. Any attempt to produce foodgrains in excess of the restrictions set by soil and climatic conditions would, in long run, result in failure. Therefore, the only alternative is to increase crop productivity and out-put together with more optimal utilization of natural resources. We have to think of the people and the land on which they are dependent along with crops, livestock, horticulture, agro-forestry etc. as an integrated single system. A sustainable land use by integrating all such and other related enterprises with crops is the need of hour to provide different channels for income and employment opportunities throughout the year.

#### 1.1. Socio-economic Challenges

The challenges of optimum socio-economic growth are many and varied, and have acquired a new dimension in the context of developments taken place in recent past.

- (i) With the introduction of high yielding varieties and hybrids, the country could produce the food grains and other commodities not only for meeting its own domestic demands, but also for exporting to other countries. Its godowns are now filled with respectable buffer stock of food-grains. It may feel happy to get relieved from food-deficiency trap and bowl begging diplomacy. But the burgeoning population has threatened this happy situation.
- (ii) In spite of surplus the accessibility to food remains a major problem. A large chunk of population are still not properly fed and most of them go to bed without or with very little food. Inefficiency and inadequacy of the system with no monitoring has created this problem. Therefore, production of adequate food supplies, greater stability in the flow of food-supplies, and accessibility to available supplies are the most important concerns.
- (iii) Imbalances in food grains production in different regions, subsidies favouring mainly to irrigated regions and large farmers, differences in access to irrigation, uneven spread of new technologies and even lack of technologies, lack of proper agricultural marketing and very poor extension support etc. are the crucial factors linked with food grains production and agricultural growth. There are varied agro-climatic regions in the country and each demands a different strategy to attend its local problems for sustained agricultural growth.
- (iv) The socio-economic condition of farming communities is at variance between and within the regions. The operational holdings are being marginalized day by day. It is unlikely that these holdings would provide enough income to the bulk of small and marginal farmers to keep them to become an active agent in agricultural production process rather than merely a long

- suffering patients. A security net needs to be provided to these farmers so that they may build up their own organizations which could take advantages of emerging scenario of changing agriculture.
- (v) A large number of educated rural youths are unemployed and they are becoming neusense to the rural society. Although economic globalization promises a lot of job opportunities, yet they are not finding place and have, rather, pushed away due to lack of adequate training support. A planned approach for developing required skills in them is needed for their adjustments in changing scenario.
  - (vi) There is a vast scope for agricultural diversification and growth of agro-based enterprises in rural areas which could contribute substantially in generating remunerative employment. Entrepreneurship development on these enterprises will provide a great relief to the unemployment problem among educated rural youths.
  - (vii) Increased use of high-tech in agricultural production poses a serious challenge of degradation of natural resources. The soil structure has destroyed. The water table has gone down and salinity/sodicity problem is increasing. The soils are subjected to severe air and water erosions in many areas. It is a right time to think of sustainable land use systems to protect and preserve the natural endowments in integrated manner.

## 2. Methodology

### 2.1. Sustainable Land Use System : An Action Research

Integrated approach to sustainable land use systems can help to manage the local resources and provide additional channels for more income and employment opportunities. This approach is helpful to optimize returns from available land, water, labour and capital resources, because it provides opportunities to analyse the socio-economic and bio-physical environment and searches for alternative technologies that could enhance the interactions between and within the system. Once the natural resource endowments of a farm are conserved and sustainably managed, opportunities for introducing new material both in crops and in livestock can be explored. High yielding seeds, improved planting materials of fruit and fodder trees, high yielding cows or poultry or small ruminants or fisheries in integration can be introduced depending upon the interests of the farming families and their available resources, If the production technology is organized on these lines, then agricultural intensification needs not lead to the deterioration of either soil fertility or water quality and availability. A balance will be maintained between increasing productivity and preserving posterity of natural resource base on which productivity depends. Keeping all these points in view, an action research on integrated approach to evolve extension strategy for socio-economic development of tribals through integrated planning and management of local resources was undertaken in tribal villages of Kanha forest range and Kalpi forest range of district Mandla in M.P. from May, 1992 to June, 1995. The programme was carried out in village clusters selected from these locations on watershed basis.

### 2.2. Project Frame Work

The district Mandla is the watershed of great Narmada, Mahanadi and Sone rivers. The topography is highly undulating with moderate to steep slopes. About two-third area is under hilly forests. The cultivated area is spread in plains of valleys, slopes of mountains and plateaus of high altitudes. The district is dominated by two scheduled tribes namely *Gond* and *Baiga*. The *Baiga* tribes are more

primitive than the *Gond*. The land use systems are governed by age-old experiences of the tribals, their food habit, ecology and marketing factors. The farming situations vary according to topo-sequence (Table 1)

**Table 1. Types of Farming Situation in the District**

Farming situations & their features	Approx. cultivated area (%)	Crops grown
<b>Hilly area</b> – Soil stony and coarse textured mixed reddish brown, yellow red and mixed red black, slope 1 to more than 5% causing sheet and gulley erosion	10.0	Kondon, Kutki, Sawan, Tur, Sesame, Maize, Niger, early mustard.
<b>Upland unbunded</b> - Soil gravely with reddish brown in colour, slope 1 to 5% causing sheet and gully erosion	30.0	Paddy, Kondon, Kutki, Maize, Jowar, Sawan, Sesame, Tur, Arhar, Mustard, Niger, Linseed.
<b>Upland banded</b> –Soil skeletal to gravely through red and yellow to black, moderate slope	30.0	Paddy, Kondon, Kutki, Sawan, Tur, Maize, Jowar, Urd, Sesame, Gram, pea, Linseed, Mustard, Niger.
a) <b>Low land banded</b> - Good fertility, soil clay loam with depth, mild slope	15.0	Paddy, Wheat, Gram, Mustard, Linseed, Pea
b) <b>Extreme low land</b> - Clay loam/silty loam with organic matter, gentle slope	5.0	Paddy, Wheat, Gram Mustard, Linseed, Pea
<b>Large banded land</b> - large banding from 2 to 20 ha. Constructed at lower side of catchment area, clay loam medium black to deep black soil.	10.0	Wheat, Gram, Linseed, Paddy

Source : Agriculture Department, Mandla, 1992

The TOT project aimed at socio-economic development of the people through integrated planning and management of local resources for sustainable land use systems which could meet the essential needs and provide additional income and employment to the tribal families throughout the year. Agriculture being a way of life of tribal was deeply rooted through their customs and traditions. It was the tribal who used to tend crops and livestock and made decisions about how their farms are to be used. The tribals, their capabilities and present drives, the social values and traditions of the society of which they were part, were found to help and hinder the agricultural development. Hence, it was conceived that they should be adequately educated to new methods that are necessary to make their farming more productive and profitable. In view of this, the methodology of "Integrated Whole Village Agriculture Development" was followed for overall development of tribal. In this, all the tribal families of the village were taken under the programmes involving crop production, animal husbandry, agro-forestry, sericulture and soil and water conservation. Awareness creation, motivation and development of tribal were the main concern of the project. Therefore, mobilizing tribal for group action through systematic simulation and assistance was considered an important accelerator of agricultural development. The following participatory activities for sustainable land uses were worked out in consultation with tribals, district agricultural extension officers and forest officers and implemented in the project areas:

Participatory analyses of socio-economic and agricultural situations, identification of specific agricultural problems and issues with their possible solutions and action plans for internal and external interventions.

Formation of core group of tribal for taking initiatives in implementation of planned activities and constant monitoring.

Organization of Block demonstrations on production technology of important crops under cereals, oilseeds and pulses based cropping systems for arousing interest and motivation.

Co-operative group action for soil and water conservation activities such as leveling, bunding, constructions of check dams, water channels, terraces, water harvesting structures, road and bridges, lift irrigation, installation of drip and sprinkler systems etc.

Group farming for agro-forestry plantations i.e. fruit, fuel and fodder trees including Mulberry plantation for sericulture.

Community nursery of paddy and fruit, fuel, fodder trees at common water sources.

Training and education on improved animal husbandry practices and agricultural technology for higher profitability in interactive mode through meeting and visits.

Documentation of indigenous knowledge and practices in agriculture and animal husbandry which sounded to be quite rational and sustainable, and incorporation of important ones in technology transfer programme.

### 3. Results and Discussion

The interventions made on important agricultural issues and their results are discussed as under:

The tribals lacked motivation for the development and management of natural resources. A planned intervention to motivate the tribals about this issue was required. Participatory techniques like, frequent group meetings and discussion, their visits to progressive farmers' fields etc. were followed. This strategy helped in confidence building and mobilizing them for articulating their needs, understanding and diagnosing their problems and finding solutions. As a result, sustainable land use plans on the basis of local resources and facilities of agriculture and forest departments were worked out and implemented in the area.

Besides illiteracy, social values, culture and communication problems, the awareness of modern farm inputs and technology was very-very low. The tribal were formerly practicing shifting cultivation know as "*Bewar*", but the situations have now much changed and they have resorted to settled cultivation on 1 to 2 hectares patta land provided to them. They have never been traditional agriculturists. They used to grow small millets in mixed form and cereals on this land as per topo-sequence. Due to poor crop productivity, they were to depend mostly on forests for their livelihood. For creating awareness and arouse interest about improved agricultural practices, a series of training programme at frequent intervals were organized, besides their visits to state agricultural farm and farms of progressive farmers. Both men and women of the tribal families were involved in this programme. The programme had added advantages of not only increasing the know-how of tribals but also bringing favourable attitudinal change conducive to adoption of agricultural technology.

Undulating topography with steep slopes, skeletal soil with shallow depth and hard rock pan in lower strata cause severe soil erosion and loss of water through run-off. Under the situation, the deep bore well was a remote possibility and moreover, a costly affair. This is the reason that the

area had hardly 2.87 per cent of irrigated area. The fruit, fodder and fuel trees in combination with suitable cropping patterns had a great promise in not only protecting soil from erosion and conserving soil moisture, but also providing gainful employment to the tribals throughout the year. Therefore, agro-forestry demonstrations and soil and water conservation activities such as construction of water harvesting structures, check dams, terraces, water channels, stone and clay bunding in low land, leveling, contour ploughing etc. were undertaken through voluntary group action. To meet irrigation demands of *rabi* crops, and fruit, fuel and fodder plantations, the agriculture department extended support in the installation of drip and sprinkler irrigation systems on subsidized rate on community basis. This helped to a great extent in increasing cropping intensity from present level of 100 to 123.83 per cent to more than 200 per cent as well as establishing planted trees under agro-forestry. It is expected that agro-forestry plants would meet the fuel and fodder demands of tribals easing the burden of dependency on the forest.

Due to unfavourable weather conditions and traditional method of cultivation, the crop productivity was very low. Poor extension support, lack of knowledge of modern cultivation practices, poor marketing and transportation etc. were found as major constraints of low crop productivity. Block demonstrations on production technology of important crops were laid out to educate and motivate them for the adoption of modern practices. The block demonstration were organized covering about 40-60% cultivable areas of a village under cropping systems perspectives i.e. cereal, pulses and oilseeds based cropping systems. The Block demonstrations had very high visual impact in motivating the tribal. The average yields of crops under block demonstrations were invariably much higher than the average yields of farmers (Table 2)

**Table 2. Results of Crop Demonstrations**

Crop	No. of demo.	Demonstration yield (q/ha)		Existing average yield (q/ha)	
		Avg. of 3 yrs.	Max.	Farmers	District
<b>A. Kharif</b>					
Paddy	395	30.14	58.00	13.5	9.60
Arhar*	73	7.41	14.00	7.05**	8.00**
Soybean	176	14.76	26.25	--	10.15
Groundnut	12	7.66	9.37	--	10.56
Composit maize	41	18.97	35.50	12.5	8.91
<b>B. Rabi</b>					
Wheat	166	26.28	46.00	18.00	8.31
Gram	272	12.44	21.75	9.00	4.95
Lentil	70	10.33	18.25	--	3.91
Sunflower	190	13.75	19.62	--	--
Mustard	760	7.65	12.15	--	--
Pea	186	13.56	24.50	--	--

\* Short duration crop, \*\* Long duration crop

The dependence of livestock for manure and draft power as well as cash income, livestock's dependence on crop by-products, and role of forests in reinforcing the above are well known in the area. The animal husbandry enterprises like dairy, goatery, piggery, poultry, fisheries etc. have

great potential for gainful employment. The bullocks were the main source of ploughing and transportation. About 1-2 small sized desi cows, 2-3 pigs and 2-6 poultry birds were, by and large, reared by the tribal families. In some cases, local buffalo (1 or 2) was also seen. Overall, animal husbandry was in a poor condition with very low productivity. Therefore, in cooperation with animal husbandry department, a series of training programme were organized to educate tribals about improved management practices. The effort provided good dividend in terms of increased livestock productivity in general.

### 3. 1. Implications of the Programme

Sufficient natural resources existed for the potential development of tribal villages. Village initiative was lacking to exploit the potential. Some concrete actions i.e. to increase their confidence in interacting with other organizations, develop their ability to organize action together, identify their needs and define them in such a way that solutions can be found out, locate the resources required for the solution i.e. internal and external, plan and take necessary action etc. required to be undertaken which would mobilize the tribal around action. Committed change agent can play this role and slowly-slowly can develop leadership among them to take charge of action taken.

Since the interaction between land resources and family labour is often the entire basis of operations, the tribals tend to resort to the pursuit of risk averse production strategy in an effort to eke out a survival. They have better information with which to decide what, when and how to use agricultural technology most effectively. From generation to generation, they have perfected the art and science of integrated farming. Traditional knowledge that has been sustained for many years can be used both as a source of knowledge and as a source of applying new knowledge and new land use systems. There is a need to verify these knowledge and practices, and use them in combination with new technology for sustainable development of tribals.

Land use planning and water harvesting should be combined for evolving an integrated strategy. The strategy to retain maximum amount of rain water in situ would provide good means to drought proofing. The tribal has inherited the skills of water harvesting and management. Their potentials need to be adequately utilized to conserve soil and water resources for sustainable agricultural production.

The socio-economic compulsions stress the need of more food and income employment opportunities. Besides agricultural intensification and diversification, particular attention is required to be given to exploring opportunities for value addition to the primary produce. For example, rice and wheat straw can be used for mushroom production or for good quality of animal feed after being enriched with urea and molasses. Uncertainty for rainfall especially late and continuous heavy rainfall often affects *kharif* sowing. Sometimes longer gaps in rainfall and early withdrawal of monsoon affects the yields of crops severely. Thus, a contingency crop-plan to meet such situation is necessary. Adequate extension support is required in this regard.

Fruit, fodder, fuel, spices and medicinal plants have a great potential in conserving soil and moisture in the soil. Agri-horti-silvi-pastoral system can create enough wealth of feed, fodder, fuel etc., besides offering scope for bee-keeping and sericulture for additional income and employment. In this way, the destruction of forest may also be avoided. Illiteracy, ignorance and social resistance were the important impediments in the adoption of modern farm technology. The tribals need to be adequately educated and motivated about the benefits of the technology through training and educational programme like, block demonstration on important crops and visit to state farms.

Animal husbandry like, dairying, goatery, piggery, poultry, fishery etc. has a great promise in tribal economy. Lack of good breeds, feed and fodder and knowledge of their management practices were the major constraints in their development. This requires to be systematically attended and promoted along with crops.

Due to heavy textured soil and its sticky nature, operations are difficult in wet lands. Lack of improved implements pose problems in tillage, intercultural and other operations. The tribals were still dependent on their primitive tools and implements causing high drudgery. There is a need to popularize improved implements so as to lessen the burden of drudgery among both men and women.

Agriculture in tribal areas is a family affair. Hence, both men and women should be taken together in planning and implementation of any programme. Maximum effort is required to gain their confidence and this must be given priority for their active involvement in the programme.

### 3.2 Personal Composite Source

The extension personnel serve as the nearest experts on practical matters for the villagers. Table 1 clearly indicates that 60% of the respondents were consulted by 46.5% of the respondents followed by 17% of the respondents from cooperative department (37.5%) and 17% of the respondents from extension office were mentioned by 17% of the respondents. 17% of the respondents consulted with the Block Development Officer.

### 3.3 Mass Media

Among the sources of mass communication, radio was used by 51.5% of the respondents (5.5%) and television (1.0%). Similar findings have also been reported by Ghosh and Mukherjee (1970).

### 3.4 Credibility of Communication Sources

The choice of respondents regarding most influential source of information was sought in order of preference out of which the first choice was considered as given in Table 2.