Du 1er au 3 juin 2009
Centre culturel de l'Université de Sherbrooke
Sherbrooke, Québec, Canada

Rendez-vous international
sur la gestion intégrée de l'eau
des outils pour AGIR

Présentation des documents fournis par les conférenciers de l'atelier

Mobilisation de la communauté

- **Sylvie Thibaudeau, agronome**
- **Shrikant Baldi, gouvernement, Inde**
- **Louis Ménard, UPA**

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NOTES BIOGRAPHIQUES

Sylvie Thibaudeau, agr. M.Sc.
Baccalauréat en agriculture en 1986 (option sols-plantes) et maîtrise en conservation des sols en 1990, de l'Université Laval. Chargée de projet en conservation des sols et de l'eau : réalisation d'études en relation avec différents aspects de la régie des grandes cultures en travail réduit du sol, semis direct et culture sur billons. Conseillère en agroenvironnement avec le club agroenvironnemental du bassin la Guerre depuis plus de dix ans. Participation à un projet de recherche de l'IRDA, intitulé « Action concertées en bassins versants agricoles ».

RÉSUMÉ DE COMMUNICATION

Atelier « Mobilisation de la communauté »
Mardi 2 juin 2009, 8 h 30 à 10 h

Le bassin versant de la rivière la Guerre : des producteurs impliqués et des résultats concluants

Depuis sa création en 1996, le club agroenvironnemental du bassin la Guerre travaille à l'implantation et à l'amélioration de plusieurs pratiques culturales. Ces activités visent à soutenir la participation concrète des membres à la protection de l'environnement, et plus particulièrement l'amélioration de la qualité de l'eau de la rivière La Guerre.

Cet objectif s'est concrétisé avec la participation du Club au « Réseau d'actions concertées en bassins versants agricoles ». Cette initiative fut rendue possible grâce à l'engagement de l'Institut de recherche et de développement en agroenvironnement (IRDA) et du ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec (MAPAQ) et grâce au soutien financier du Fonds d'action québécois pour le développement durable (FAQDD) et de son partenaire financier, le gouvernement du Québec, ainsi que du Conseil pour le développement de l'agriculture du Québec (CDAQ).

Un des principaux objectifs de ce projet était de quantifier l'amélioration de la qualité de l'eau résultant des actions des entreprises agricoles dans l'implantation de pratiques culturales de conservation et l'aménagement des terres.

Concrètement, le projet s'est déroulé sur six ans (2001-2007). De 2001 à 2003, l'équipe de projet s'est attardée à mesurer et décrire la circulation de l'eau et des nutriments (phosphore et azote) dans le cours d'eau, en réponse aux pluies et à la fonte des neiges.

L'aménagement des terres, initié au printemps 2003, s'est appuyé sur un diagnostic précis de l'égouttement à l'aide de photos aériennes, de la caractérisation du relief (microtopographie) et de la localisation des sites actifs d'érosion. L'aménagement judicieux de différentes structures, telles chutes enrochées, perrés, puits d'infiltration, voies d'eau engazonnées, bassins de captage et avaloirs, permet d'évacuer plus « en douceur » les lames d'eau ruisselées. Tout en assurant un drainage adéquat des terres, ces aménagements favorisent la sédimentation au champ et réduisent l'arrachage et le transport du sol par le ruissellement. Les aménagements réalisés comprennent notamment l'implantation de 13 km de bande riveraine arbustive, la stabilisation par génie végétal de 3 km de sections de ruisseau, la réfection de 2,6 km de sections de cours d'eau, et la plantation de 5,5 km de haies brise-vent. Les agriculteurs et leur famille se sont impliqués de façon particulièrement dynamique à tous les niveaux, contribuant notamment à la hauteur d'environ 30 % du coût total de l'aménagement des terres dans le bassin. En plus du financement initial du projet, la réalisation de plusieurs aménagements a été supportée par une aide financière du programme Prime Vert du MAPAQ. Une importante contribution financière a aussi été octroyée par la municipalité de Saint-Anicet pour l'aménagement des emprises de chemins publics.

En parallèle, les agriculteurs participants au projet ont adopté des pratiques culturales de conservation sur une partie importante des superficies en cultures annuelles, telles le semis direct, l'application de lisier en post-levée des cultures et le semis de cultures de couverture. À titre d'exemple, en 2001, 6 % des superficies en cultures annuelles du bassin à l'étude étaient en semis direct. Ce pourcentage est passé à 51 % en 2006. Pour faciliter l'achat de machineries bien adaptées au semis direct, des membres du Club agroenvironnemental ont mis sur pied une Coopérative d'utilisation de machinerie agricole (CUMA).

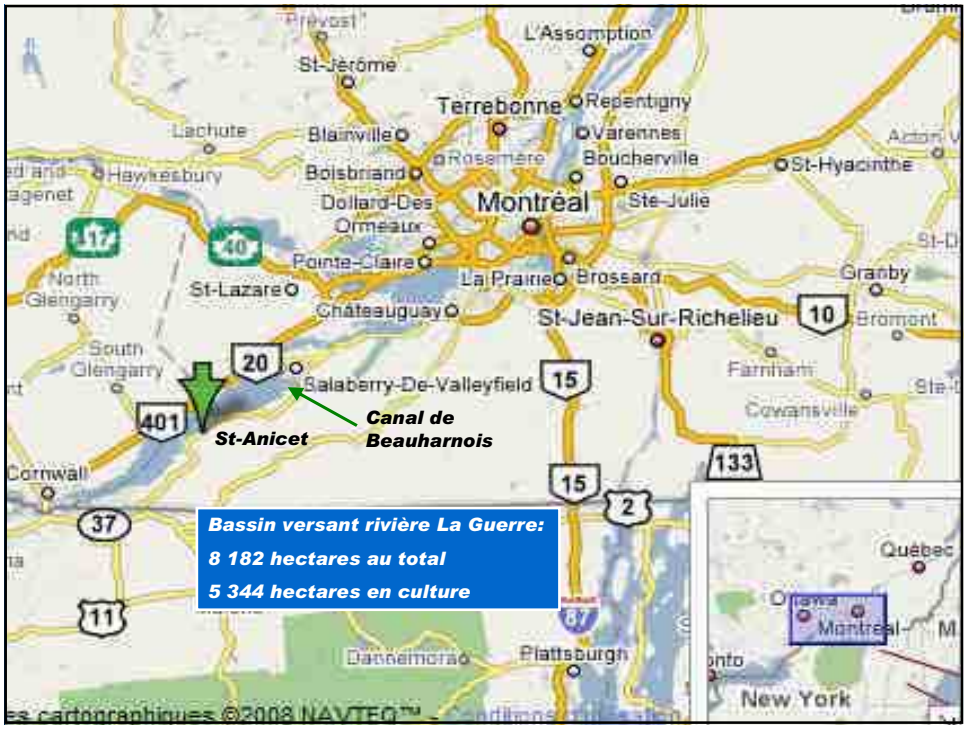
Enfin, la reprise des mesures de qualité de l'eau de 2005 à 2007 a permis de quantifier l'effet des aménagements hydro-agricoles et des pratiques agricoles de conservation sur la qualité de l'eau. Ce suivi a mis en relief une réduction significative des exportations de sédiments (- 34 %), de phosphore (- 42 %) et de nitrates (- 29 %) à l'exutoire du bassin à l'étude. Cette amélioration bien tangible de la qualité de l'eau est le résultat de l'ensemble des pratiques agricoles de conservation et des aménagements réalisés dans le cadre du projet. Le dispositif de l'étude ne permet cependant pas d'associer ces réductions à l'une ou l'autre des interventions.

La détection d'une amélioration de la qualité de l'eau d'une telle amplitude à l'échelle d'un bassin versant agricole est sans précédent au Québec. L'effet combiné des pratiques agricoles anti-érosives (dont le semis direct et le semis de cultures de couverture) et des aménagements hydro-agricoles explique l'amplitude de la réponse de la qualité de l'eau.

En prime aux enseignements techniques et scientifiques, les principaux gains de cette vaste expérience se mesurent bel et bien à l'échelle humaine. L'investissement unanime des producteurs agricoles dans l'aménagement de leurs terres et de leurs ruisseaux témoigne d'une responsabilisation et d'un solide engagement à l'égard des enjeux environnementaux.

LE BASSIN VERSANT DE LA RIVIÈRE LA GUERRE: DES PRODUCTEURS IMPLIQUÉS ET DES RÉSULTATS CONCLUANTS.

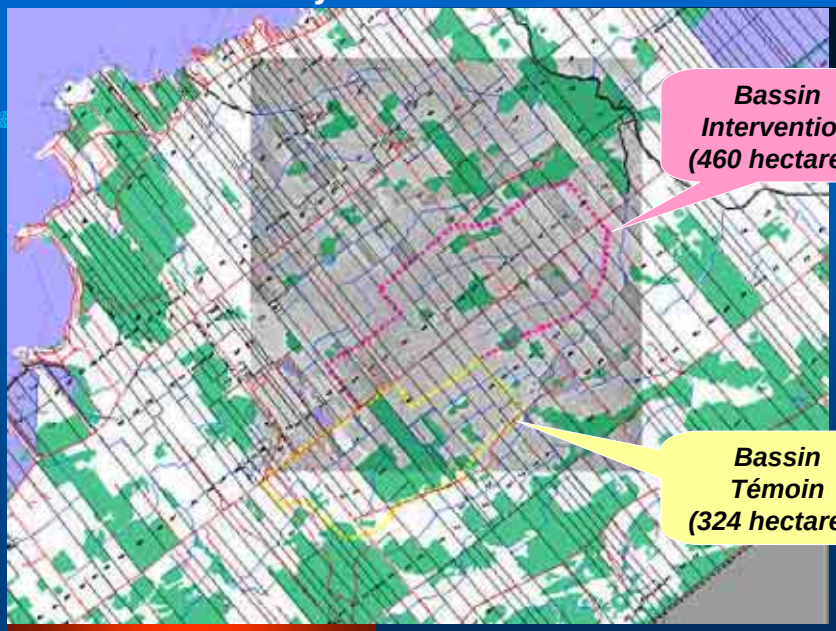
Sylvie Thibaudeau, agr. M.Sc.
Terre à terre agronomes-conseils
Conseillère, club agroenvironnemental
du bassin La Guerre, St-Anicet.



La rivière La Guerre d'hier à aujourd'hui: une histoire d'eau.

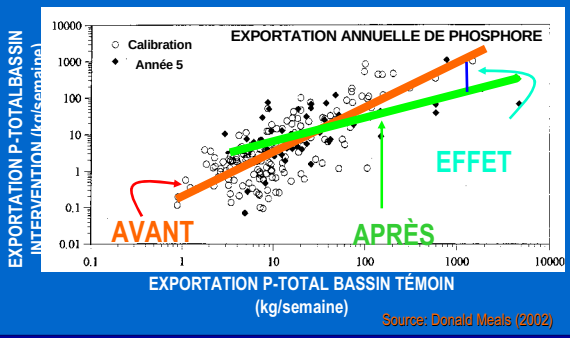
- 1932: construction de la centrale hydroélectrique de Beauharnois et du canal de Beauharnois ont régularisé le niveau du lac à 0,9 mètre plus haut que le niveau moyen à l'état naturel.
- 1933: déviation des eaux de la rivière La Guerre dans la rivière Saint-Louis. Un barrage fut alors installé à l'embouchure de la rivière La Guerre.
- 1974: construction par le MAPAQ d'une station de pompage afin d'évacuer l'eau de la rivière La Guerre dans le lac Saint-François. Problème de cohabitation.
- 1986: réalisation de plusieurs études pour améliorer la situation.
- 1996: formation du club agroenvironnemental du Bassin La Guerre.
- 2001: Projet « Réseau d'actions concertées en bassins versants agricoles », piloté par Aubert Michaud, IRDA.

Étude des bassins jumeaux de la rivière La Guerre



La démarche expérimentale.

DEUX PÉRIODES:
Calibration & Intervention



Source: Donald Meals (2002)

Une démarche en trois étapes.

- Suivi agroenvironnemental de la période de référence (2001-2003);
- Aménagement du parcellaire et introduction des pratiques agricoles de conservation (2003);
- Suivi agroenvironnemental de la période d'évaluation (2005-2006).

La phase de référence 2001 à 2003

Suivi agronomique:

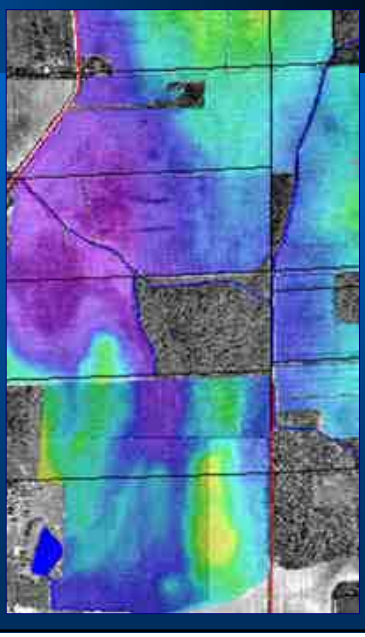
Collecte de données sur:

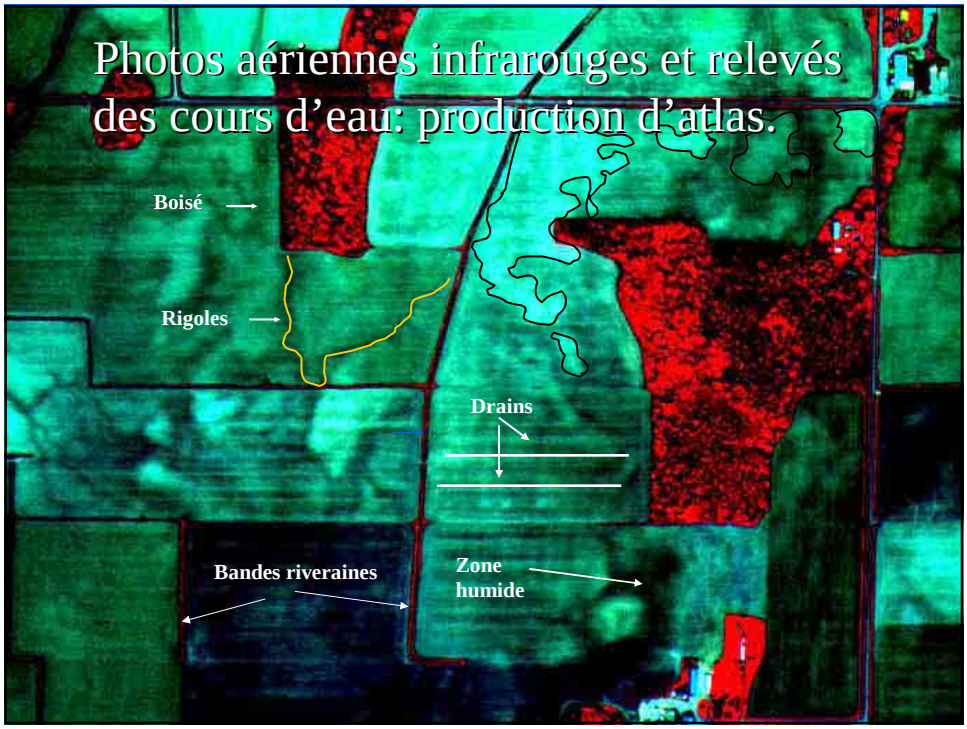
- cultures
- pratiques culturales
- fertilisation
- types de sol

La phase de référence 2001 à 2003

Suivi agronomique:

Relief et hydrologie

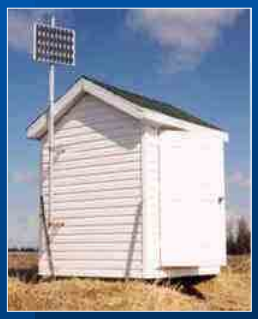




La phase de référence 2001 à 2003

- **Suivi du milieu aquatique**

Station d'échantillonnage



Échantillonnage de la qualité de l'eau

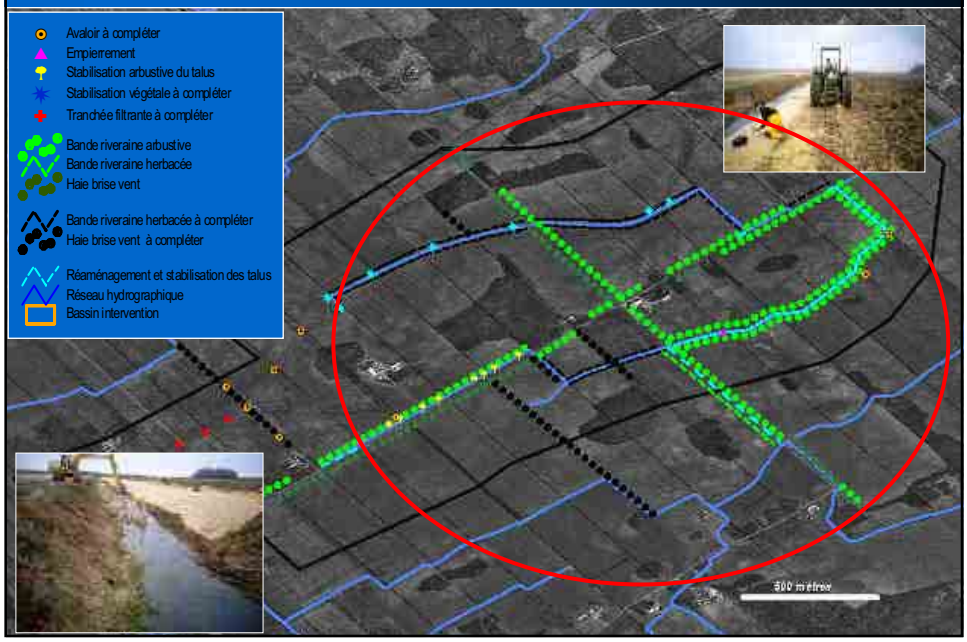
Nitrates, phosphore et sédiments

La phase d'aménagement du bassin *Intervention, initiée en 2003.*

- La mise en place de structures de contrôle du ruissellement .
- L'aménagement systématique de bandes riveraines .
- La plantation de haies brise-vent .
- L'adoption de pratiques culturales de conservation .

- Implantation de 13 km de bande riveraine arbustive.
- Stabilisation par génie végétal de 3 km de sections de ruisseau.
- Réfection de 2,6 km de sections de cours d'eau.
- Plantation de 5,5 km de haies brise-vent.

Aménagements en bordure de cours d'eau



Efficacité environnementale des bandes riveraines.

- **Efficacité de captage très variable:**
  - **Sédiments = 20 à 99%**
  - **Phosphore total = 1 à 96%**

- Pourquoi?
  - Situation idéale: Ruissellement lent, laminaire, bien réparti sur l'ensemble du champ.
  - Situation réelle: écoulements préférentiels et érosion printanière.

20 à 26% de la superficie agricole fournit plus de 50% des pertes de phosphore et de sédiments. (rivière aux Brochets, A. Michaud, 2005)

En pratique?

- Optimiser la gestion des fertilisants et la qualité du sol.
- Réduire l'érosion au champ (pratiques culturales réduites).
- Combiner à d'autres méthodes de conservation, particulièrement pour contrer l'érosion printanière (voies d'eau engazonnées, chutes enrochées, avaloirs, nivellement, etc.).

L’adoption de pratiques culturales de conservation.

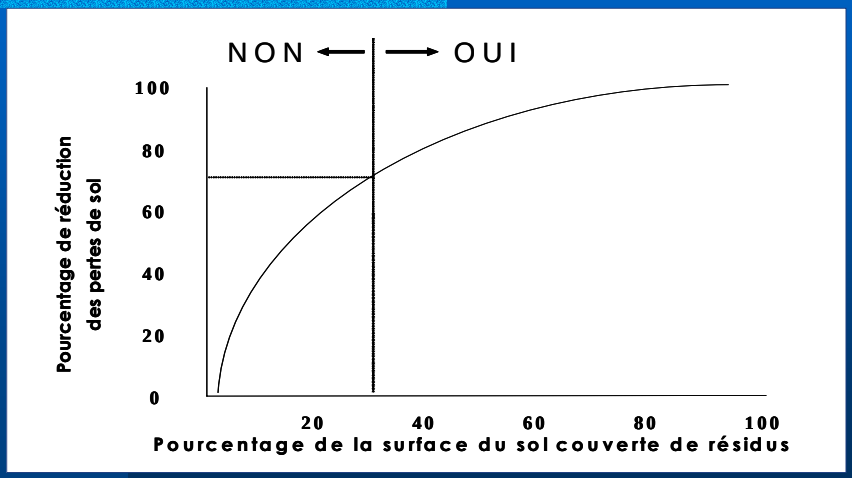
- Travail réduit du sol
- Rotation des cultures
- Cultures de couverture
- Fumiers en post-levée

Travail réduit du sol.

« Tous systèmes de travail du sol ou de semis dans lesquels au minimum 30% de la surface du sol est couverte par les résidus végétaux après semis. »

Réduction de l ’érosion.

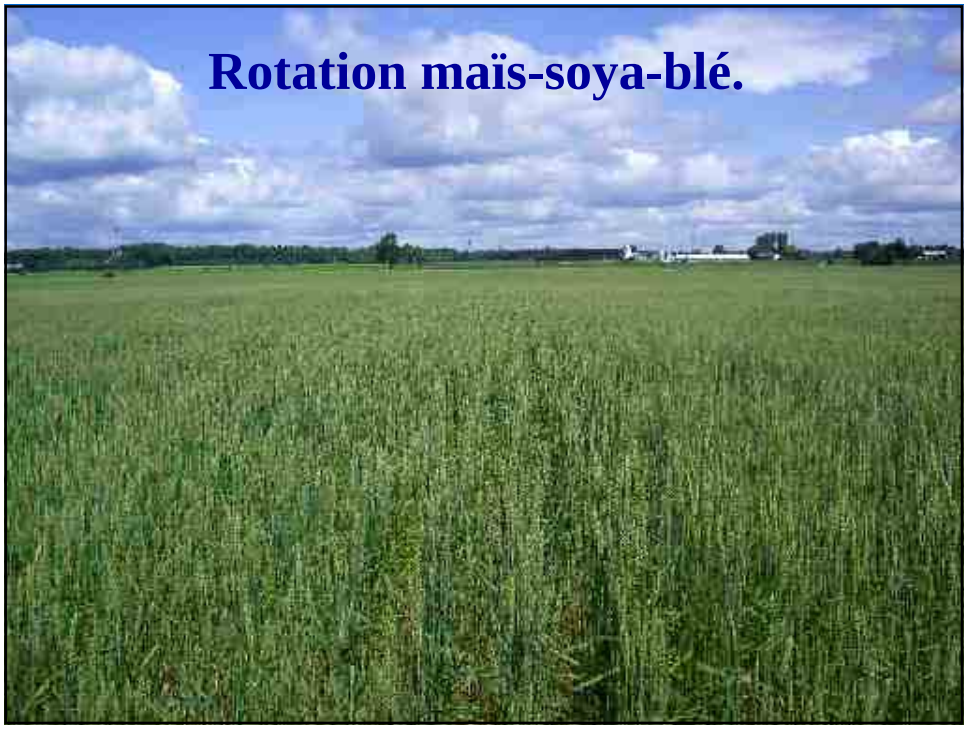
Pratique culturale réduite?



Le semis direct.

- Bassin intervention:
  - 2001: 6 % des superficies cultures en annuelles
  - 2006: 51 %
- Ensemble des membres du club:
  - 1999: 8 %
  - 2007: 49 %
- Création d'une CUMA

Rotation maïs-soya-blé.



Implantation de cultures de couverture.

Application du fumier en post-levée.

- **11 % en 2003**
- **87 % en 2005**

La phase d'évaluation (2005 à 2007)

- **réduction significative des exportations à l'exutoire du bassin intervention de:**
  - **sédiments (- 34 %)**
  - **phosphore (- 42 %)**
  - **nitrates (- 29 %)**
- **La détection d'une amélioration de la qualité de l'eau d'une telle amplitude à l'échelle d'un bassin versant agricole est sans précédent au Québec.**

Des gains tangibles sur la qualité de l'eau… et au-delà.

- **Complémentarité des lignes de défense agroenvironnementales.**
- **Investissement unanime des producteurs agricoles.**
- **Rayonnement « hors projet ».**
- **Implication de la municipalité.**
- **Action sociale positive avec les riverains du Lac Saint-François.**

Journée « Bassin ouvert »
20 septembre 2007

Pour plus d'information :

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BIOGRAPHY

Shrikant Baldi
Secretary (RD) Govt. of Himachal Pradesh (India)

COMMUNICATION SUMMARY

Workshop : « Mobilisation de la communauté »
Tuesday June 2 2009, 8 h 30 - 10 h

Participatory watershed management for sustainable agriculture in Himachal Pradesh India

India shares 16% of the world population, while its land is only 2% of the total geographical area of the world. Naturally, the pressure on the land is often beyond its carrying capacity. Therefore, the productive lands, especially the farmlands in the India are in the constant process of various degrees of degradation and are fast turning into wastelands. At present, approximately 68.35 million hectare area of the land is lying as wastelands in India. Out of these lands, approximately 50% lands are such non-forest lands, which can be made fertile again if treated properly.

Similarly, in Himachal Pradesh also large portion of land is not being used productively. Only 10% of its geographical area is under cultivation and out of this only 19% is irrigated. Nearly 70% to 75% of the rainfall takes place during the month June to September and remaining 8 months suffer from water scarcity. The physiography of the State does not allow construction of major and medium irrigation schemes. At many places, lift water supply schemes have been constructed for lifting the water from rivulets, to the higher reaches. However, the maintenance cost of these schemes is prohibitive due to heavy electricity charges. Thus, in past first the rain which falls on the hilly terrain was allowed to flow into the rivers/rivulets as runoff and then some parts of it is brought back, through lift schemes. Therefore, to solve these problems watershed approach has been adopted in Himachal Pradesh since 1995-96. The aim is to stop and conserve water where it falls, so that it can be used for a longer period of time. The availability of water during dry season leads to sustainable agriculture.

Himachal Pradesh has followed a unique participative model of execution of micro watershed projects in the State. Once a watershed project is sanctioned by the government, the fund for the execution of the project is transferred to the concerned Gram Panchayat (local Government). A Gram Panchayat comprises of elected representatives from each ward, headed by a President who is directly elected by the people living in the Gram Panchayat area. A Gram Sabha, (democratic forum for planning at village level) consists of all the adult members living

in a village or group of contiguous villages with a population of 1000 to 5000 persons.

The Gram Sabha through the participatory rural appraisal finalizes the activities to be done under a watershed project. Thereafter, the Gram Panchayat prepares action plan for execution of various works under the project and also mutually finalizes the usufructs amongst the beneficiaries. These approved activities are executed by the concerned Gram Panchayat under the technical guidance of the watershed development team. The watershed projects are funded by state government/Government of India, however, beneficiaries have to contribute 10% cost of the work. The money collected from the beneficiaries is kept in a separate bank account, called watershed development fund, which is used for the maintenance of assets created under a watershed project.

The Integrated Watershed Management Projects at present covers the different components which are aimed at land based activities relevant to the ecology of hill areas and resulting in the sustainability of livelihoods of those who are engaged in agriculture and allied activities. The activities are carried out as per watershed development plan approved in a democratic manner. Ridge to valley approach is followed while implementing watershed development plan. The evaluations of the Watershed Projects are conducted by the Evaluators empanelled by the State Government and also by the National Level Monitors.

In Himachal Pradesh, 1837 micro watersheds have been identified with a total outlay of 5.298 billion INR for treatment of 8.54.386 hectare of land in all 12 districts of the State. The programme was started in 1995-96 and till Jan. 2009, an area of 4,57,609 Hectares has been treated with the total expenditure of 2.864 billion INR. (One US $ is equivalent to 50.65 Indian rupees)

The watershed interventions have led to significant increase in production of vegetables. The farmers have also got benefited from increase in agriculture and horticulture production, due to availability of water in dry season for irrigation. The increase in agriculture and horticulture production has changed the life style of farmers in project areas. The per capita income of farmers has increased substantially due to shift to cash crops and income from sale of milk. The most important part is that these positive changes are sustainable because they are based on regeneration of natural resources in the watershed areas. Farmers are now less dependent on the vagaries of weather and could get their livelihood in a sustainable manner.

The model is needed to answer complex questions related to future growth and water management challenges such as climate change. Future scenarios are simulated by modifying the input files to reflect anticipated increased wastewater effluent flows and/or decreased effluent nutrient concentrations.

Recently GRSM was used to support the development of a Wastewater Treatment Master Plan for a Regional Municipality that owns 14 wastewater treatment plants that discharge directly into the Grand River or its tributaries. Several model runs were completed to simulate the impact of anticipated effluent flows in the future (i.e. as population grows). The model was also used to evaluate the relative benefits of different upgrades and improved effluent quality. The output from these model runs were compared to see what improvements in river water quality are associated with each option relative to current conditions.

The real value of any model lies in the ability of the model to predict the response of a system to changes in model inputs that can be related back to particular management strategies. GRSM provides information on the relative benefits associated with a particular

set of scenarios and what cumulative effects each strategy may have on downstream water quality. The model has several advantages: it is a dynamic model capable of simulating a broad range of realistic conditions; it includes a number of complex, rapidly changing processes; it covers a large spatial area that includes multiple point and non-point sources (i.e. can look at cumulative impacts); and it can be customized to meet local needs

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PARTICIPATORY WATERSHED MANAGEMENT FOR SUSTAINABLE AGRICULTURE IN HIMACHAL PRADESH (INDIA)

A Participatory & Democratic Model

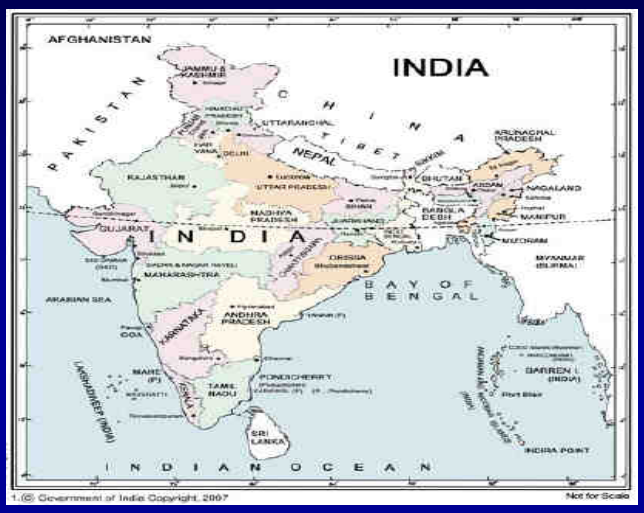
Shrikant Baldi Secy Rural Development Govt. of HP India

STRUCTURE OF THE PAPER

Paper aims at presenting the

- objectives,
- Organization /Institutional arrangements,
- planning,
- execution,
- interventions,
- progress and current status,
- Overall impact and outcomes.
- attempts to share the unique features of implementation of watersheds in a democratic and participative way at a decentralized level.

INDIA



INDIA –SALIENT FEATURES

- Shares 16% world population, land 2% of the total geographical area of the world.
- Tropical monsoon climate
- Agriculture & allied activities main occupation-60% of people dependent on agriculture
- 68.35 million hectare area of the land is lying as wastelands (20.8% of the geographical area)
- 50% of waste lands can be made fertile again if treated properly


Himachal Pradesh
JAMMU & KASHMIR
JAMMU & KASHMIR
LAHAUL & SPITI
CHAMBA
KANGRA
KULLU
KINNAUR
MANDI
SHIMLA
SOLAN
SIRMAUR
BILASPUR
UNA
HAMIRPUR
PUNJAB
HARYANA
U.P.
UTTARAKHAND
CHINA
TIBET
Dalhousie
Chamba
Pathankot
Dharamsala
Keylong
Chandratal
Losar
Kibber
Ki
Kaza
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Puh
Kalpa
Reckong Peo
Jeori
Sarahan
Sangla
Chhitkul
Manali
Kullu
Mandi
Hamirpur
Una
Bilaspur
Shimla
Solan
Nahan
Ludhiana
Chandigarh
Dehradun
50 Kilometers
50 Miles
N

Tandi Lahul

Theog Shimla

Fagu Shimla

One Village

HIMACHAL PRADESH –SALIENT FEATURES

- Wholly mountainous region in the lap of Himalayas
- Climatic conditions vary from the semi- tropical to semi-artic
- Mainstay of the people of Himachal Pradesh is agriculture, terraced cultivation-68%
- 10 percent of the total area is cultivated
- 19 % of cultivated area is irrigated because of its physiographic constraints

Ultimate Irrigation Potential of H.P.

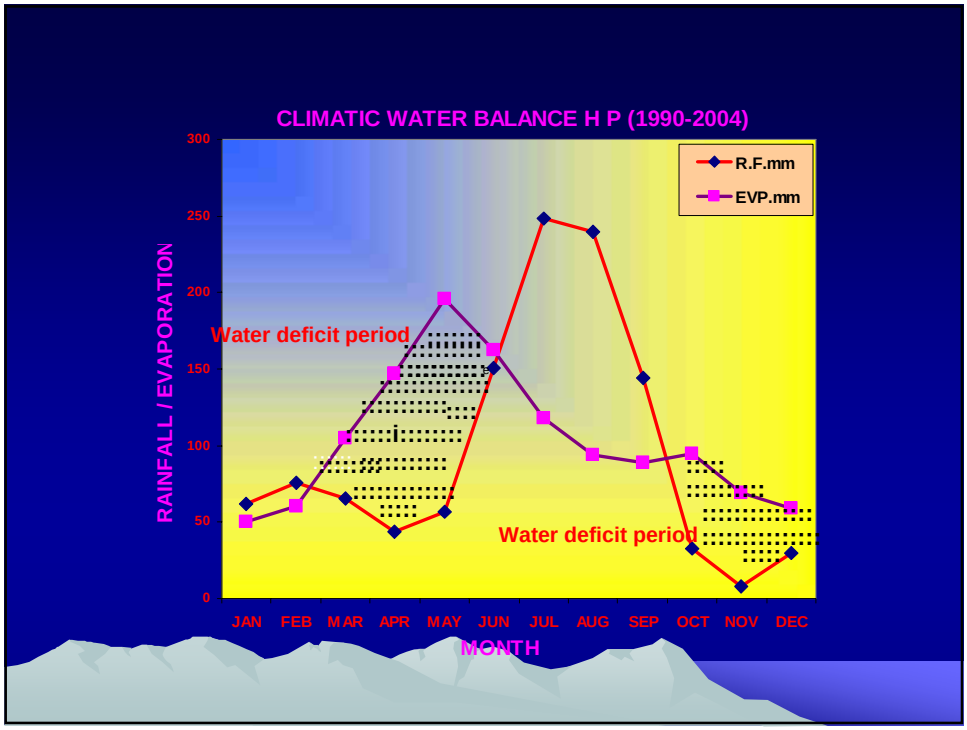
S.No.	Particular	Lakh Hectare	%age of net area sown
1	Total Area	55.67	
2	Net area sown	5.58	
3	Area which can be brought under irrigation		
	Major and Medium -0.50	3.35	60%
	Minor irrigation-2.85		
4	Net irrigated area	1.05	18.8%

WHY-WATERSHED DEVELOPMENT PROGRAMME IN H.P.

- Normal monsoon rainfall (June to September) varies from 170 to 3000 mm. Average rainfall 1100 mm
- Due to hilly terrain water moves very fast to the lower areas leading to soil erosion
- Water scarcity for 7 to 8 months every year
- Physiography does not allow major and medium irrigation schemes
- Lift water supply schemes have been constructed to lift the water, maintenance cost is prohibitive due to heavy electricity charges. Only 19 % area irrigated

WHY-WATERSHED DEVELOPMENT PROGRAMME

- To solve these problems, watershed approach adopted in Himachal Pradesh since 1995-96
- watershed development in Himachal Pradesh tries to reduce the volume and velocity of runoff through a series of interventions which helps in availability of water during dry season.
- Availability of water during dry season leads to sustainable agriculture.



Difference in Approaches

- Traditional Approach
  - Regulation of Natural Resources
  - Implementation by Govt. Department
- New Approach of Watershed
  - Centralized to decentralized and people centred
  - social solutions rather than technical solutions
  - Integrated (Ridge to valley) then each department working in isolation

OBJECTIVES

- Promoting the over all economic development and improving the socio economic conditions of the rural people by ensuring sustainable agriculture.
- Mitigating adverse effects of extreme climatic conditions such as drought etc.
- Community led sustainable development of rain-fed /watershed areas.
- Stability and sustainability in farm income.

PARTICIPATIVE INSTITUTIONAL STRUCTURE

- **State level**
  - Rural Development Department of the State is nodal department for monitoring, evaluation and review the progress
- **District level**
  - implemented through DRDA),
- **Block/PIA level**:
  - Implementation is with Block Development Officer & his staff
  - Implementation is reviewed regularly by the Panchayat Samiti, headed by the Chairman

INSTITUTIONAL STRUCTURE (CONTD.)

- **Watershed Development Team**
  - to ensure the quality of works and for other technical support to the Panchayats, disciplines of Forestry/Plant science, Animal Science, Civil/ Agricultural Engineering and Social Science
- **Panchayats**
  - Execution of micro watershed project by local elected bodies i.e Gram Panchayats.

RESPONSIBILITIES OF PANCHAYATS (local elected bodies)

- **Planning:**
  - Participatory planning processes at village level with the involvement of all stakeholders
  - Identification of specific interventions for treatment on arable and non-arable lands
  - Integration of proposals into Watershed Development Plans

RESPONSIBILITIES OF PANCHAYATS (CONTD.)

- **Participatory Rural Appraisal**
  - WDT tours the watershed area extensively in association with Gram Panchayat.
  - Information is collected through community participation about soil and water management problems.
  - The treatment plans and intervention are decided after elaborate PRA exercise, then documented in shape of DPR for the particular watershed.
  - Approval of village assembly i.e. Gram Sabha

EXECUTION OF WORKS

- Unique participative model of execution of micro watershed projects
- funds for the execution of the project is transferred to the Gram Panchayat
- Gram Panchayat prepares action plan for execution of various works and also mutually finalizes the usufructs amongst the beneficiaries
- funded by government, beneficiaries have to contribute 10% cost of works
- Gram Panchayat maintains proper record/ account of the funds and its utilization

INTERVENTIONS

- Activities are carried out as per watershed development plan democratically approved
- Ridge to valley approach is followed
- Ridge area is treated through afforestation & soil conservation activities to slow down the velocity of rain water & soil erosion
- Community & private agriculture lands are treated with fodder plants, water harvesting structure and other interventions

INTERVENTIONS (CONTD.)

WATER HARVESTING STRUCTURE

- **Construction of check dam at Bather Mandi**
  - **60000 litre water could be stored resulting into revival of the irrigation channel**
  - **irrigation facilities in additional 11 hect. area of the village and the water table increased**

CONSTRUCTION OF IRRIGATION TANK

- **akhun, Chagar Nallah Distt. Mandi**
  - **scarcity of drinking water, irrigation facilities, soil erosion and flood problem**
  - **one tank constructed with Rs. 1.17 lakhs**
  - **irrigation facility to for 8 hectare area**
  - **Farmers are**
    - **producing cash crops**
    - **per capita income increased**
    - **soil erosion contained.**

CONSTRUCTION OF IRRIGATION CHANNEL

- Village Chango Nadhoh, District Solan
  - **totally dependent on rains due to lack of irrigation facilities**
  - **Irrigation Channel and one tank were constructed**
  - **After raising the water level, the water was brought through a Irrigation Channel 8 families benefited and 4 hectare area irrigated**
  - **producing cash crops in addition to food grains**

CONSTRUCTION OF PERCOLATION POND

- Watershed Project , Rajgarh, Sirmour
  - Percolation pond constructed to conserve run off rain water at Tikkar having capacity of 30000 ltrs.
  - used for ground water recharging and irrigation of about 3 hectare of land
  - villagers are not facing the problem of water scarcity.

CONSTRUCTION OF WELL

- Dada Siba, Block Pragpur, Kangra
  - Gurala area was under acute shortage of drinking water
  - a well in the village with an amount of Rs. 40000/-
  - 30 families have benefited & also cultivating cash crops and floriculture

SOIL & MOISTURE CONSERVATION ACTIVITIES

To protect the soil and to reduce the soil erosion such as

- gully plugging
- trenching
- crate work etc. are carried out to reclaim the land and to reduce the soil erosion.

These activities reduced soil erosion and positive impact on agriculture horticulture development has been noticed .

Some success stories reveal this fact.

CONSTRUCTION OF NALLAH BUNDS

- Dumat Behli, District Mandi
  - soil erosion in the Nallah was very high
  - degradation of land & reduction in production of crops, fodder
  - 6 bunds were constructed
  - soil erosion checked
  - 10 hectare land belonging to 10 families have been reclaimed
  - Land reclaimed for production of fodder

CONTOUR TRENCHES WORK

- Village Thor, District Sirmour
  - contour trench works have been undertaken
  - 10 hectares land developed
  - 40 families of the village benefited
  - traditional water source (Bowli) revived
  - Orchards developed as a result of moisture conservation

SCIENTIFIC METHODOLOGY TO CHECK SOIL EROSION

- Bohar Nallah catchment in Chopal block, Shimla
  - land sliding main problem due to run off water
  - causing damage to fertile land
  - 10 crate wire structures constructed
  - 5 ha. Land treated.
  - 10 families benefited

PASTURE DEVELOPMENT

Live stock rearing is an integral part of rural economy in Himachal

Improved grasses are planted in the watershed areas to ensure the availability of sufficient and quality green fodder to the animals of community

Raising of forest nurseries & plantation of fodder species undertaken to Improve the availability of fodder through community participation

In watershed areas the quantity of fodder has increased resulting into proportionate increase in the quantity of milk .Some success tales are shared

PLANTATION OF GRASSES

- Khudar Majharnu, Block Drung, Mandi
  - area had unwanted bushes and no quality grasses were grown
  - root stock of grasses like Napier and Satria were provided to the 10 families
  - one hectare area developed planting improved variety of grasses.
  - Now sufficient green fodder available

IMPROVED VARIETIES OF FODDER PLANTS

- Village Bharan, Kathli Bharan, Sirmour
  - fodder plants like mulberry, lucaenia have been planted in one ha. land
  - sufficient green fodder made available to 5 families
  - milk production has increased
  - additional income & economic status improved

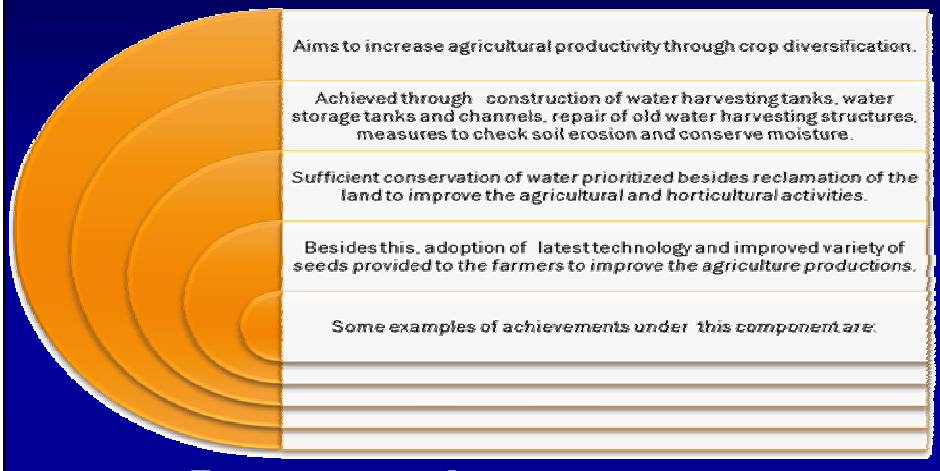
AFFORESTATION

- In ridge area, afforestation is done to slow the velocity of rain water & to check the soil erosion.
- Plantation work is taken up to increase the vegetation cover in identified areas.
- Focus has remained to enhance the fodder quantity in the identified areas.
- Fodder plants have been sown to meet the requirement of fodder as well as fuel wood.
- An overview of the positive achievements through two success stories:

PLANTATION OF FODDER & MEDICINAL PLANTS

- Watershed Dhalot, Hamirpur
  - plantations under watershed areas the availability of fodder has increased in village Khandera, Narsi, Bafri
  - moisture conservation improved
  - Increase in fodder production has resulted in increase in the milk production in the area.

AGRICULTURE DEVELOPMENT



CHANGE IN CROPPING PATTERN

- Sepur Nallah, Shimla
  - construction of a tank,
  - 5 hectare additional irrigation potential created
  - 15 families switched over to cash crops & vegetable production
  - families are getting annual income of Rs. 30,000/- to 40,000/- p.a

HORTICULTURE DEVELOPMENT

Aim to raise & diversify fruit production and conserve soil and moisture through establishing perennial tree crops with suitable ground cover on steep slopes.

Main activities are nursery raising, distribution of horticulture plants.

Nurseries development and fruit plants provided to the farmers

Orchards comprising fruit tress like Apple, Mango & Citrus

FLORICULTURE GROWTH

- Dhar Chanana, Block Chopal, Shimla
  - ❑ a water storage tank of 50000 ltrs capacity constructed
  - ❑ seed flowers provided to 50 families for floriculture in 3 hectare area
  - ❑ each family producing flowers of worth Rs 50000/ to Rs. 60000/ in each season

CAPACITY BUILDING & TRAINING

- Training to all the functionaries on
  - ▪ Technical and organizational aspects
  - ▪ Exposure visits to Research Stations/ successful watersheds
  - ▪ 5% of project cost for training and capacity building of functionaries

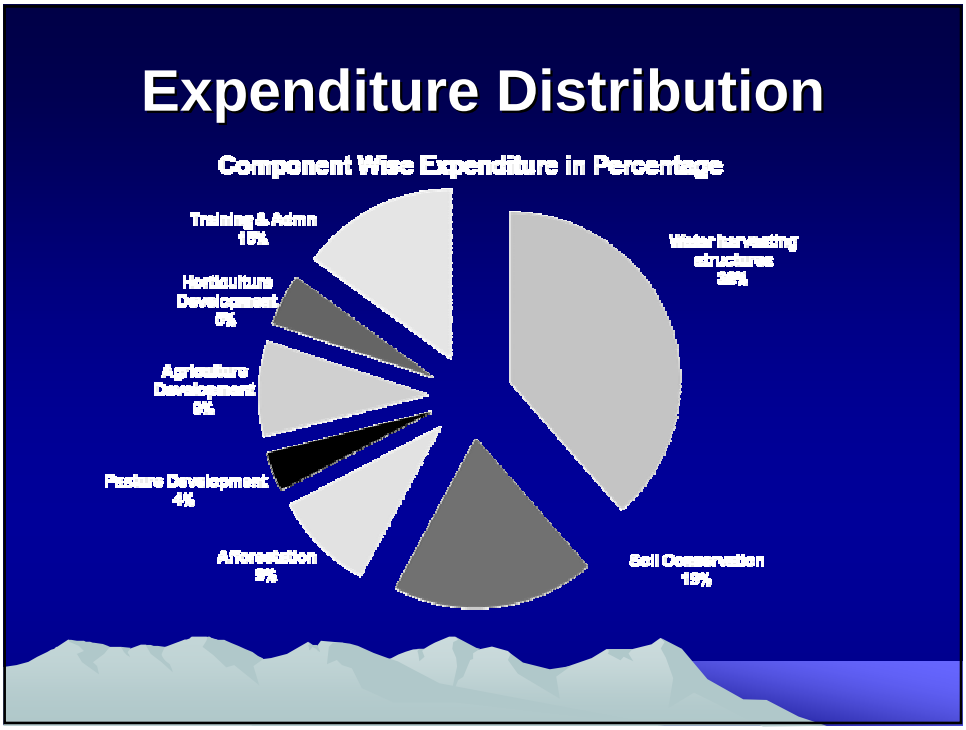
MONITORING AND EVALUTION

- Evaluations by Evaluators empanelled by the Government and National Level Monitors.
- The mid term Evaluation reports, carried out after expenditure of 45% funds, are pre requisite for release of further installment of funds.
- Main purpose of evaluation is to assess whether projects have achieved the desired goal of sustainable agriculture and livelihood development in rural areas

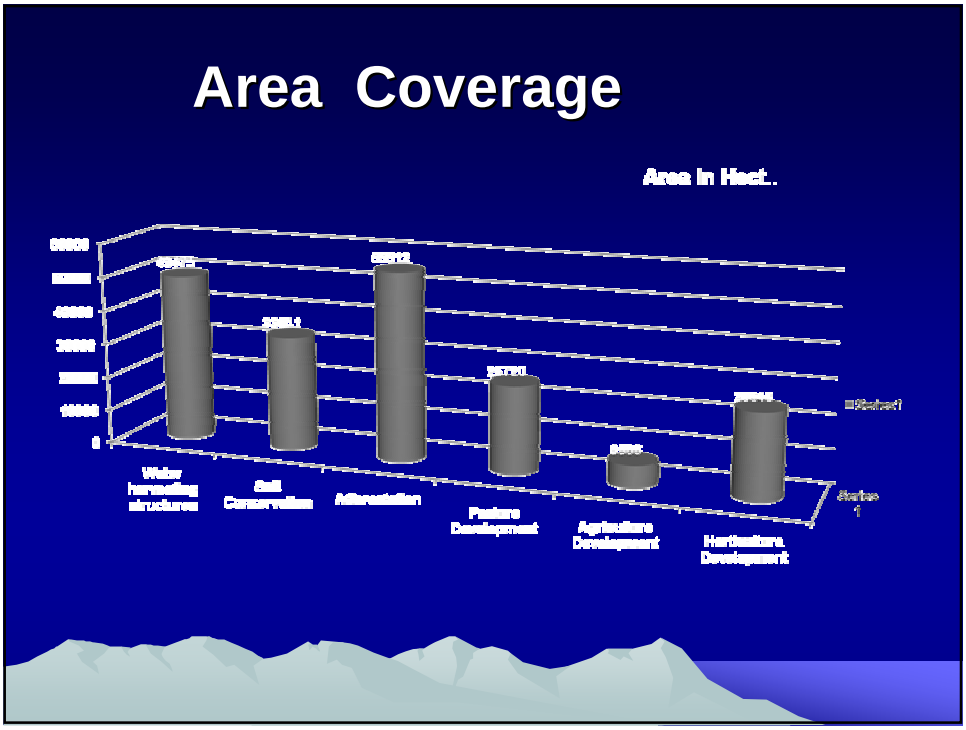
Overall Achievements

Components	Exp. in Crore Rs.	No. of Structures created	Area brought under : (in Hect.)		
			Irrigation	Afforestation	Agriculture Horticulture Pastures
Water harvesting Structures	110.43	28841	49475	-	-
Soil Conservation	55.17	22068	-	-	33841
Afforestation	27.32	-	-	55512	
Pasture Development	10.58	-	-	-	25720
Agriculture Development	26.00	-	-	-	6580
Horticulture Development	13.96	-	-	-	25049
Training & Admn.	42.93	-	-	-	
Total Expenditure	286.43 Crore Rs. Or 57.28 million USD				

Expenditure Distribution



Area Coverage



Overall Impact and Outcomes of Participative Watershed Management

- 49,475 Hectare area under irrigation (additional 10.8% area.) Vegetable production increased by 1.95 lakh tonnes.
- Boost to Horticulture.- Area increased by 25049 Hectares and production increased by 75000 tonnes.
- Increase in Fodder and Milk Production.
- Increase in Agriculture productivity due to preservation of top soil.
- Increase in cropping intensity.
- Diversification in Agriculture.
- Regeneration of Natural Resources.
- Sustainable livelihood.

CONSTRAINTS & CHALLENGES

- Need for trainings, capacity building and exposure to modern scientific and technical methods,
- Team building to work in user groups.
- Linking soil conservation activities with livelihood.
- While locating civil structures, more technical guidance needed

FUTURE STRATEGY

- Perspective Plan to cover all remaining areas in next 15 years. Plan worth 933.6 million USD for treating 31.12 lakh Hectare area prepared.
- Advocacy on dissemination of Watershed approach as the best alternative for poverty alleviation since it attempts to harvest the water for irrigation facility results into increase in agriculture and fodder production, ultimately resulting into sustainable livelihoods.
- Strengthening and enhancement of genuine participative democracy at the grass roots, to make informed choices and ensuring more equitable, sustainable and efficient outcomes.
- State Government has decided convergence of NREGA scheme with the watershed programme for additional funding.

THANK YOU

Participatory Watershed Management for Sustainable Agriculture in Himachal Pradesh (India)

Shrikant Baldi

Secretary (RD) Govt. of HIMACHAL PRADESH(India)

Introduction

The spirit of India lives in villages and only by changing the face of rural India, we can seek a better future for its masses. Rural Development Department of Government of Himachal Pradesh is engaged in changing the face of Rural Himachal through its many fold development schemes, working in a participatory manner with the rural folks. Nearly 90% of Himachal Pradesh population still resides in rural areas and is deprived of earning sufficient income to make both ends meet due to inadequate irrigation facilities, traditional cultivation techniques and degradation of land. Land degradation has created a serious ecological and socio economic crisis in the State as well as many parts of India. The Shortage of fuel -wood, fodder and poor agricultural productivity are common problems in many parts of the country. To address these problems as well as to provide support to the main occupation i. e. agriculture, Integrated Watershed development approach has been adopted and Watershed Development Projects have been initiated by Government of India & Government of Himachal Pradesh.

This paper aims at presenting the objectives, organizational structure, planning, execution, interventions, progress and current status, and sustainability of assets/infrastructure created under the Watershed Programmes in Himachal Pradesh. The paper also endeavors to find out nature of fund utilization pattern and the scale of participation of village community/beneficiaries in the planning and execution of projects. It also attempts to share the unique features of implementation of watersheds in a democratic and participative way in a decentralized manner besides taking an account of challenges at various levels and prescribing appropriate strategy for convergence with other flagship programmes in rural development sector.

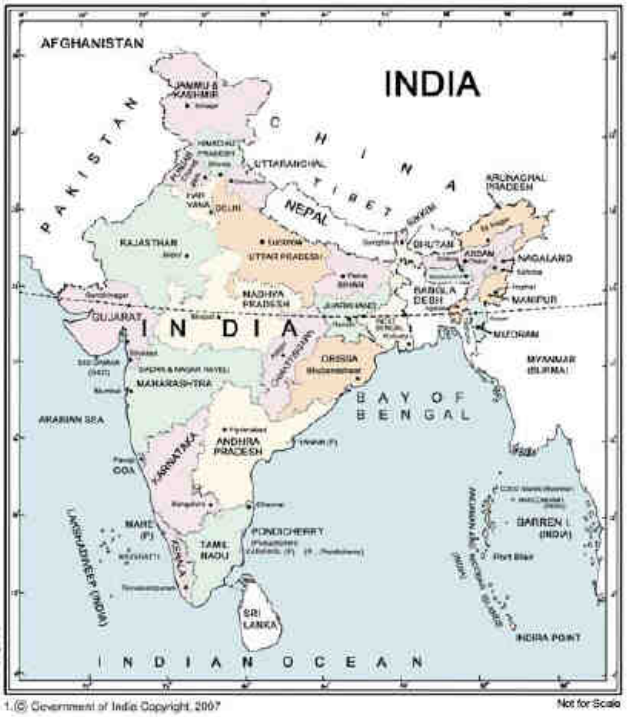
The sections that follow in this paper, present an overview of some important statistics that have a bearing on the sustainable agriculture development issues which shape implicit socio-economic philosophy of the rural development programmes under implementation.

1.0 India:

India derived its name from the river Indus, which flow through north-west India-now north-west India and Pakistan. India lies to the north of the equator between $8^{o}4'$and $37^{0}6'$ north latitude and longitudes 68° 7' and 97° 25' east and measures about 3,214 km from north to south between the extreme latitudes and about 2,933 km from east to west between the extreme longitudes. The Indian peninsula is separated from mainland Asia by the Himalayas.

The Country is surrounded by the Bay of Bengal in the east, the Arabian Sea in the west, and the Indian Ocean to the south, Afghanistan and Pakistan to the north-west; China, Bhutan and Nepal to the north; Myanmar to the east; and Bangladesh to the east of West Bengal. Sri Lanka is separated from India by a narrow channel of sea, formed by Palk Strait and the Gulf of Mannar. The climate of India can broadly be classified as a tropical monsoon one. But, in spite of much of the northern part of India lying beyond the tropical zone, the entire country has a tropical climate marked by relatively high temperatures and dry winters.

India shares 16% of the world population, while its land is only 2% of the total geographical area of the world. The population of India as on 1st March, 2001 stood at 1028 million. Naturally, the pressure on the land is often beyond its carrying capacity. Therefore, the productive lands, especially the farmlands in the India are in the constant process of various degrees of degradation and are fast turning into wastelands. At present, approximately 68.35 million hectare area of the land is lying as wastelands in India (20.81% of area). Out of these lands, approximately 50% lands are such non-forest lands, which can be made fertile again if treated properly. It was unprotected non-forestlands, which suffered the maximum degradation mainly due to the tremendous biotic pressure on it.



2.0 Himachal Pradesh:

Himachal Pradesh was conferred of statehood on 25th January, 1971. Himachal Pradesh is situated between 30o 22' 40" to 33 o 12' 20" north latitudes and 75 o 45' 55" to 79 o 04' 20" east longitudes. It is a wholly mountainous region in the lap of Himalayas with altitude ranging from 350 metres to 6975 meters above mean sea level. The climatic conditions vary from the semi- tropical to semi-artic. there are 12 districts, 52 sub-divisions, 109 tehsils and sub-tehsils in Himachal Pradesh.

From development point of view, the Pradesh is divided into 77 development Blocks. The smallest unit for development- cum-administration is Panchayat and their number is 3243. The State has a three tier Panchayati Raj structure comprising of 12 Zila Parishads, 75 Panchayat

Samitis and 3243 Gram Panchayats on the rural side; and 1 Municipal Corporation, 20 Municipal Councils and 28 Nagar Panchayats on the Urban side besides 7 Cantonment Boards.

2.1 Demographic Indicators:

Himachal Pradesh having highest proportion of Rural Population i.e. 90.2% ranks first among all the states of India. Other important demographic features of India and Himachal according to 2001 census are as under:

Table- Demographic Indicators

Sr. No.	Item	Unit	Himachal Pradesh	India
1.	Total Area	square kilometers	55,673	32,87,263
2.	Total Population	Million persons	6.08	1028.61
	Males	Lakh persons	30.88	5321.57
	Females	Lakh persons	29.90	4964.53
3.	Density	persons	109	313
4.	Sex Ratio	per 1000 Males	968	933
5.	Rural Population	%	90.20	72.2
6.	Population Below Poverty Line (2002-07)	%	23.87	27.5
7.	Per Capita Income	INR	31198	22946
8.	Literacy Percentage	%	76.5	64.8
	Males	%	85.30	75.3
	Females	%	67.40	53.7

Source: 1. Statistical Outline 2007-08, Economics & Statistics Deptt., Himachal Pradesh.
2. Statistical Pocket Book India- 2005, Central Statistical Organisation, Government of India.

2.2 AGRICULTURE PRODUCTION:

While nearly three-fourth of India's population lives in villages, in Himachal Pradesh more then four-fifths of the people live in rural areas. Almost one- fourth of the state's State Domestic Product comes from agriculture and allied sectors. Traditionally, agriculture is of subsistence nature and is unable to elevate the level of living of the rural people.

The details of Area and Production of food grains, major commercial crops in Himachal Pradesh during 2006-07 are depicted in the following table: -

Table: Agricultural Production

Sr. No	Item	Unit	Himachal
1.	Food grains Production	'000 M.T	1668.85
2.	Vegetable Production	000 M.T	1000.00
3.	Commercial Crops	000 M.T	69.54
4.	Mushroom Production	M.T.	918.04
5.	Hops Production	M.T	42.60
6.	Fruit Production	'000 Tons	695.52
7.	Area Under Fruits	Hect.	1,97,445
8.	Honey Production	M.T	1605.00
9.	Milk Production	000 M.T	870.00
10.	Wool Production	Lakh Kgs	16.50

Source: Annual Plan 2008-09, Planning Department, Himachal Pradesh.

2.3 Irrigation Facilities

Agriculture, being the main occupation of the people of Himachal Pradesh, has an important role in the economy of the State. It provides direct employment to about 71 per cent of the main working population. Income from the agriculture and allied sector accounts for nearly 22.5 per cent of the total State Domestic Product. Nearly 70% to 75% of the rainfall is received during monsoon season from June to September. During this period the rain water causes severe soil erosion and damages to the cultivated land due to lack of vegetative covers. The water flowing down from the hills simply drains away as surface runoff and causes floods in the plains. The physio-graphy of the state does not allow construction of medium and major irrigational scheme therefore, the watershed approach is best way to conserve the rain water and use the same after the monsoon season. The following table indicates irrigation facilities in Himachal vis-à-vis India:

Table- Irrigation Facilities

Sr. No.	Particulars	Unit	Himachal	India
1.	Net Area sown.	Hect.	5.58	1428.19
2.	Area sown more than once.	Hect.	3.59	467.24
3.	Gross cropped area.	Hect.	9.47	1895.43
4.	Cropping intensity	%	176	133
5.	Net irrigated area	Hect.	1.05	551.43
6.	Gross irrigated area.	Hect.	1.76	732.75
7.	Gross irrigated area	%	18.58	38.65
8.	Average size of operational holdings	Hect.	1.21	1.55

Source: Statistical Outline 2007-08, Economics & Statistics Deptt., Himachal Pradesh.

2.4 Rural Infrastructure

Himachal Pradesh is characterized by strong traditions, culture and heritage. At the time of its formation in 1971, Himachal Pradesh was an economically backward rural state with 93 percent rural population which was deprived of basic amenities such as health, education and drinking water. Rural infrastructure, i.e. rural roads, electricity, housing, transport, banking and market network was also very poor. Almost half the rural households were living below the poverty

line. Successful implementation of various plans and programmes reduced the rural poverty, gradually. Good improvement has taken place in the provisions of basic amenities and building up rural infrastructure.

Himachal Pradesh has comparatively better rural infrastructure facilities now such as cent per cent rural electrification, Good network of rural roads and piped drinking water supply. In the present economic situation, agriculture and rural development, especially agriculture and allied activities, are now poised for a paradigm shift.

2.5 Natural Resources

Natural resources of Himachal Pradesh have a direct relationship with its physiographic conditions including relief, climate, drainage and geology. These in turn influences the type of soils and the kind of vegetation cover. The total area of Himachal Pradesh is 55,673 sq. km. Hardly 10 percent of the total area is cultivated and the actual forest cover extends to 22.5 percent of the total area. Permanent pastures and other grasslands account for about 24 percent of the total area. Barren and unculturable land covers about 14 percent of the area of the state. The state is richly endowed with a hilly terrain having catchment areas of river Satluj, Beas, Ravi and Chenab. As such the State has enormous potential of water resources in the form of glaciers and rivers but ground water resource is limited. In-spite of the fact that a large volume of water is available in the State, only 20% of its cultivated area is irrigated because of its physiographic constraints. The normal monsoon rainfall (June to September) in the State varies from 170 to 1200 mm.

2.6 Ground Water Resources

The ground water resource occurs mainly in unconsolidated sediments of inter-mountain valleys and in the sub-mountain tract. Kangra, Una, Hamirpur, Bilaspur, Mandi, Solan and Sirmour districts, particularly their valley areas, depend upon groundwater. The exploitation is done through open wells, tube wells, infiltration galleries and wells. The status of development of ground water resources in the State is given in the below table:-

Table- Ground Water Resources

STATUS OF GROUND WATER RESOURCES IN HIMACHAL PRADESH		
Total replenishable groundwater resources	0.036 m	Ham/yr
Provision for domestic, industrial and other uses	0.007 m	Ham/yr
Available net groundwater resources for irrigation	0.029 m	Ham/yr
Net utilizable groundwater resources for irrigation	0.026 m	Ham/yr
Net draft	0.005 m	Ham/yr
Balance groundwater resources for future use	0.024 m	Ham/yr
Level of groundwater development	18.18 %	
Utilizable irrigation potential by groundwater development	68,500	ha
Source: CGWB, Ministry of Water Resources, H P Development Report.		

3.0 Watershed Development Programme in Himachal Pradesh:

In Himachal Pradesh most of the rainfall takes place during the month of June to September every year. The rain fall is very intense during these months and many a time it is very heavy for few days. The number of rainy days does not average more than 50-60 days in a year. Due to hilly terrain water moves very fast towards the lower area leading to soil erosion. Further, there remains water scarcity for 7 to 8 months every year, in most parts of the State. The physiography of the state does not allow construction of major and medium irrigation schemes. In Himachal, lift water supply schemes have been constructed for lifting the water from rivulets, to the higher reaches. However, the maintenance cost of these schemes is prohibitive due to heavy electricity charges. Thus, in past first the rain which falls on the hilly terrain was allowed to flow into the rivers/rivulets as runoff and then some parts of it is brought back, through lift schemes.

All that a dry land farmer has his assets is his soil and the rain water that falls on his land. If one could try to manage them efficiently, the productivity in dry land could be increased, the profitability enhanced, stabilized and sustained. Unlike the irrigated farming, the dry land agriculture has many constrain starting with climate, soil, crops and socio-economic conditions. Rainfall is the critical factor among the climatic parameters, having great influence on the crops to be grown. The rain fall is not only low but erratic, unpredictable and distributed in short period in rain-fed areas. Well prepared "Micro Watershed Projects" based on the study of climate water and plant resources on the one hand and man and animal resources on the other, offers great scope for bringing about sustained natural resource development

The soil in hills show great diversity in texture, structure depth, etc. Besides soil and climate, the crop being cultivated in the dry lands are found to be of long duration, which do not synchronize to the actual cropping seasons. These are low yielders and do not respond to improved package of practices, In addition to this, the present cultivars are not tolerant to drought nutrient status, pests diseases and other soil related constraints hampering crop cultivation.

Therefore, to solve these problems watershed approach has been adopted in Himachal Pradesh since 1995-96. A watershed is geo-hydrological unit, which drains into common point. The aim is to stop and conserve water where it falls, so it can be used for a longer period of time. The watershed development in Himachal Pradesh tries to reduce the volume and velocity of runoff through a series of interventions. The aim is to make the water walk, rather than let it run. The simple methods of stalling rainwater from running off have an enormous impact on the overall health of the watershed. Since rainwater is intervened at regular intervals by watershed structure, it does not flow long distances. Therefore, it cannot gather speed, volume and force.

Photograph of a Degraded Wastelands at Talon Bankala, Sirmour

3.1 Objectives:

Government of Himachal Pradesh launched the Integrated Watershed Development Programmes in the State with objectives of integrated agriculture and livelihood development in the rural areas of the State. The main objectives of watershed approach are:

i) Promoting the over all economic development and improving the socio economic condition of the rural people by ensuring sustainable agriculture.

ii) Mitigating adverse effects of extreme climatic conditions such as drought and desertification on crops, human and livestock population for their overall improvement.

iii) Encouraging village community for sustained community action for the operation and maintenance of assets created.

iv) Employment generation, poverty alleviation, community empowerment and development of human and other economic resources of the village.

3.2 Institutional Arrangements:

The Institutional arrangements for the implementation of watershed development projects are as under:

3.3.1 State Level:

Under the supervision and guidance of State Government, the Rural Development Department of the State is nodal department for implementation and monitoring of watershed development programmes at state level. Under the administrative control of the Secretary (RD), the Director and Special Secretary, Joint Secretary, Deputy Director and other officials are involved for smooth implementation of the programme in the state.

3.3.2 District Level:

In each district, under the overall control of Deputy Commissioner-cum- Chief Executive Officer, the watershed development programme in the district is being implemented through the District Rural Development Agency (DRDA) which is a registered agency under society Registration Act 1860. Apart from other officials, the full time Project Director, Project

Officer and Assistant Project Officer (Watershed), are involved in the implementation, review, monitoring, training/ capacity building, release of funds to the PIAs and evaluation of the projects at district level. Finalization of project proposals, approval of the budget and work plan etc. are the main functions of Governing Body of DRDA headed by the Chairman Zila Parishad (elected representative of PRI) consisting of officials and non official members.

3.3.3 Block/Project Implementation Agency level:

At the block level, the implementation of watershed projects is with the Executive Officer – cum- Block development Officer of the respective development block having sufficient supporting staff. The implementation of the projects, release of funds to the executing agencies, submission of reports to the DRDAs, inspections, motivating the panchayats for their active participation, preparation and approval of Watershed development Plan, community organization etc are the main functions of the Programme Implementation Agency (PIAs). The implementation of the projects is reviewed regularly by the Panchayat Samiti, an elected body of Panchayati Raj Institutions headed by a Chairman.

3.3.4 Watershed Development Team (WDT):

Without technical knowledge, the possibilities of execution of poor quality works can not be ruled out. Thus to ensure the quality of works and for other technical support to the Panchayats, the Watershed Development Team (WDT) of 4-5 members from the disciplines of Forestry/Plant science, Animal Science, Civil/ Agricultural Engineering and Social Science is constituted to handle 10-12 micro watershed development projects. This team is posted at the Block headquarter under the supervision of Block Development Officers. The watershed development plans are prepared by the WDT members in consultation with Gram Panchayats. After PRA exercise, the information is generated in connection with preparation of watershed development plan, the meeting of Gram Sabha Members is called by the WDT members for discussion and finalization. After approval of Watershed Development Plan by the Gram Sabha, the same is approved by the PIA.

3.4 Planning:

To achieve the objectives of Watershed development projects, primary responsibility of the department is to ensure proper planning and implementation of projects with active participation of communities. At the State level, areas for watershed projects are identified with the help of State Remote Sensing Agency. The provision of funds, capacity building through dedicated institutions, and community mobilization are the important issues for success of

watershed management. A provision @ 6000 INR per hectare has been kept under watershed management which includes the following components:

1.	Administration	10%
2.	Training & Community Mobilization	5%
3.	Works	85%

(i) The funds under Administration component are utilized for payment of honorarium to WDT members and to meet the requirement of other contingent expenditures. The training funds are utilized for capacity building of all the stakeholders/ functionaries including representative of PRIs.

3.4.1 Participatory Rural Appraisal:

Participatory rural appraisal refers to a set of tools and techniques used with house hold to gather and analyze information relating to community resource status, problem, potential and needs. In implementation of Watershed Projects, PRA is used to analyze the current situation in a village community. Participatory Rural Appraisal (PRA) is one of the most important exercises in watershed development projects prior to finalization of action Plan. After sanction of project, the WDT tours the watershed area extensively in association with Gram Panchayat. Various type of information is collected through community participation about soil and water management problems in the area and possible solutions. The treatment plans and intervention are decided after elaborate PRA exercise, then documented in shape of detailed project report for a particular watershed. These are, thereafter, discussed and approved in the Gram Sabha.

3.5 Execution of works at the Watershed level:

Himachal Pradesh has followed a unique participative model of execution of micro watershed projects in the State. Once, a watershed project is sanctioned by the government, the fund for the execution of the project is transferred to the concerned Gram Panchayat (local Government). A Gram Panchayat comprises of elected representatives from each ward, headed by a President who is directly elected by the people living in the Gram Panchayat area. A Gram Sabha, (democratic forum for planning at village level) consists of all the adult members living in a village or group of contiguous villages with a population of 1000 to 5000 persons.

The Gram Sabha through the participatory rural appraisal finalizes the activities to be done under a watershed project. Thereafter, the Gram Panchayat prepares action plan

for execution of various works under the project and also mutually finalizes the usufructs amongst the beneficiaries. These approved activities are executed by the concerned Gram Panchayat under the technical guidance of the watershed development team. The watershed projects are funded by state government/Government of India, however, beneficiaries have to contribute 10% cost of the works. The money collected from the beneficiaries is kept in a separate bank account, called watershed development fund, which is used for the maintenance of assets created under a watershed project.

It is the primary responsibility of the concerned Gram Panchayat to maintain the proper record/ account of the funds received from the PIA and its utilization for the purposes for which these funds are released. The Panchayat Secretary/ Panchayat Sahayak of the respective village Panchayat is entrusted the duty of maintenance of record/ accounts properly, the financial audit of the Panchayat is also conducted regularly. The watershed funds are utilized by User Groups (UGs) to ensure the active participation of beneficiaries for proper use and further maintenance of assets created under watershed project.

3.6 Interventions/Activities:

The Integrated Watershed Management Projects at present covers the different components which are aimed at land based activities relevant to the ecology of hill areas and resulting in the sustainability of livelihoods of those who are engaged in agriculture and allied activities. The activities are carried out as per watershed development plan approved in a democratic manner. Ridge to valley approach is followed while formulating watershed development plan. First the ridge area of a watershed is treated through afforestation and soil conservation activities to slow down the velocity of rain water and also to check soil erosion. Then the remaining community and private agriculture lands are treated by planting fodder plants, construction of water harvesting structure and other intervention required as per the location of the land in the watershed. The watershed intervention depends on the slope soil and vegetation etc. The main activities under watershed development include:

3.6.1 Construction of water harvesting structures: The maximum rainfall in the state occurs during the monsoon season from June to September. During rainy season the rain water generally drains away as surface runoff into the rivers due to which the availability of water remain insufficient for drinking as well as irrigation during dry season. To harness the rain water, the construction of water harvesting structures such as check dams, ponds, percolation tanks, wells etc. are prioritized under watershed development programme. With the

construction of water harvesting structures the problem of drinking as well as irrigation is tackled during dry season. Some successful stories of this component are as under:

3.6.1.1 Construction of check dam:

In village Badher, Development Block Chauntra, Distt Mandi, the inhabitant of the area were deprived of the irrigation facilities from the existing water channel as the water level had gone down due to soil erosion in Bhajrala nallah.

To rejuvenate the water table, a check dam was planned in the area. An amount of Rs. 50000/- was provided for construction of check dam in the nallah to revive the water channel. It has been observed that with the construction of check dam approximately 60000 litre water could be stored resulting into revival of the Kuhal. Now, the people of the area are getting the irrigation facilities in additional 11 hect. area of the village.

3.6.1.2 Construction of Irrigation Tank:

The inhabitants of village Rakhun, Chagar Nallah Distt. Mandi were facing hardships due to scarcity of drinking water, irrigation facilities, soil erosion and flood problem during rainy season. The affected area of the said village has been addressed by constructing check dams, crate wire bunds and irrigation water channels under watershed development programme.

For example, one tank was constructed with an investment of Rs. 1.17 lakhs for storage of rain water and to utilize it for irrigation during dry season**.**

Additionally, Rs. 30,000/- were spent for construction of a check dam to provide irrigation facility for 8 hectare area under watershed project. Now the farmers of this village are producing cash crops and their per capita income has increased substantially. The persistent problem of soil erosion has also been contained.

3.6.1.3 Construction of Check Dam:

The main occupation of the people in village Dhantar, District Bilaspur is cultivation and milch livestock rearing. They were neither able to grow sufficient crops nor produce adequate milk due to non availability of irrigation facility for growing crops and fodder. An intervention was made to harness the water by constructing a check dam. With a small investment of Rs 30,000,a check dam was constructed in the area to conserve the rain water under watershed development project.

Due to creation of this structure, the farmers of the area received ample irrigation facilities which resulted in growing of cash crops. They are getting annual income up to Rs. 60000/- per annum whereas prior to construction of this structure, their income was limited to Rs. 10000/- per annum only.

3.6.1.4. Construction of irrigation Channel and Tank:

The main economic activity of people of Village Chango Nadhoh, District Solan has been food grain production but it was totally dependent on rains due to lack of irrigation facilities. During 2001-02, one water channel and one tank were constructed. Total amount to the tune of Rs. 1,10,000/- which includes 20,000/- as community contribution was spent for construction of water channel and tank in the village, besides construction of check dam in the nearby nallah. After raising the water level, the water has been brought through a water channel for further distribution to the farmers for irrigation. With the construction of this scheme 8 families of village Chango Nadoh have been benefited and 4 hectare area have been irrigated. With the construction of this scheme, the beneficiaries are producing cash crops in addition to food grains and their income has increased many folds.

3.6.1.5 Construction of percolation pond:

Under Watershed Project Sirmour-II, water harvesting structures have been created in Rajgarh area to conserve the runoff and to use the harvested water for recharging of ground water. A percolation pond has been constructed to conserve surface runoff in micro watershed Tikkar having capacity of 30000 ltrs approximately. The water is being used for ground water

recharging and irrigation of about 3 hectare of land. Due to creation of this structure now the villagers are not facing the problem of water scarcity.

3.6.1.6 Construction of Well:

In village Dada Siba, Development Block Pragpur District Kangra, the lower Gurala area was under acute shortage of drinking water during summer. Consequently the drinking water was provided to the community of the area through vehicles engaged by the Government. As an intervention, it was decided to construct a well in the village with an amount of Rs. 40000/- under watershed development Programme. With the construction of well approximately 30 families have benefited and some farmers are also cultivating cash crops and floriculture. Sufficient area of the village is now being irrigated and the community is getting additional income from floriculture and cash crops.

3.6.1.7 Irrigation Channels

In the absence of proper irrigation channels most of the water available for irrigation purpose is not utilized properly or got wasted. The irrigation channels constructed at different sites have increased the utilization of water for irrigation.

3.6.2 Soil & Moisture Conservation Activities:

The activities to protect the soil and to reduce the soil erosion such as gully plugging, trenching, crate work etc. are carried out in the watershed areas under this component to reclaim the land and to reduce the soil erosion. After execution of soil conservation activities, the soil erosion has reduced and positive impact on agriculture horticulture development has been noticed. Some success stories reveal this fact as under:

3.6.2.1 Construction of Nallah bunds in village:

In village Dumat Behli, District Mandi under Watershed Project-V, the soil erosion in the Nallah Behli Dhar was very high consequently the villagers were worried about degradation of land and reduction in production of Crops & fodder etc.

To ameliorate this situation, 6 bunds were constructed in this nallah by spending an amount Rs. 42000/- under Watershed Development Project. With the construction of bunds, the soil erosion has been checked and 10 hectare land belonging to 10 families have been reclaimed.

3.6.2.2 Contour Trenches work:

The activities such as gully plugging, contour trenching, bench terracing etc. have been adopted under watershed development project for development of barren land and moisture conservation. In village Thor, District Sirmour contour trench works was undertaken with an expenditure of Rs. 64000/-. Approximately, an area of 10 hectares has been developed and 40 families of the village have benefited with this effort. The traditional water source (Bowli) has also been revived and the orchards have been developed by the villagers in the respective area as a result of moisture conservation. The availability of fodder has increased and people of the area are getting the benefit of these activities.

3.6.2.3 Trenching work in village Bhadesh Bhadeli:

The soil erosion problem in Bhadesh Bhadeli village, district Sirmour was very acute and due to surface runoff, the fertile soil was draining in to the nallah. As a measure to check this problem, the trenching work was carried out in 8 ha. area by spending an amount of Rs. 24000/-. Consequent upon it, the rain water runoff has been arrested by making the trenches in the area to increase percolation of rain water in the soil. Napier grass has been planted in the area and the fodder production has increased by 60% in the project area. The milk production has also increased 40 to 50 % and the villagers are getting additional income of Rs. 10,000 to 20,000 annually

3.6.2.4 Scientific Methodology to check Soil Erosion:

With the objective to check massive soil erosion and high soil run-off, scientific methodology has been adopted wherein construction of check dam/crate wire structure/bank stabilization and continued contour trenches, crate wire structure have been made in a scientific manner under watershed projects.

In Bohar nallha catchment in Chopal block, district Shimla, the soil erosion and flood during rainy season causing damage to fertile land and land sliding in the area was main problem due to runoff water.

To protect the fertile land and to use the catchments areas for cultivation of crops it was decided by the watershed community that the crate structures be constructed in the problematic area of the catchment. Accordingly 10 crate wire structures costing Rs. 85000/- have been erected and an area of 5 ha. has been treated. 10 families residing in these catchment areas have been benefited by protecting rich soil. There is apparent increase in water table, the sufficient vegetation is visible in the catchment area and the beneficiaries are also using their land for cultivation of different crops.

3.6.3 Pasture development:

The improved species of grasses are planted in the watershed areas to improve the availability and quality of fodder in watershed areas. The raising of forest nurseries through community participation and, plantation of fodder species have been undertaken to improve the availability of fodder in the project areas. Live stock rearing is an integral component of rural economy in Himachal. There is a dynamic relationship between common property resources such as forest, water and grazing land, live stock and crops. Livestock rearing depends on fodder and grass grown on common property resources to a large extent. The improved grasses are planted in the watershed areas to ensure the availability of sufficient and quality green fodder to the animals of community. In watershed areas the quantity of fodder has increased resulting into proportionate increase in the quantity of milk. Some success tales are shared in the following text:

3.6.3.1 The root stock of improved variety of grasses like Napier and Satria were provided to the 10 families in village of Khudar Majharnu in development block Drung district Mandi for plantation in barren land and in corners of their fields.

Prior to watershed development project, this area was covered with unwanted bushes and no quality grasses were grown. The villagers have cows of local breed and milk production was very low which was limited to one to two litres per day per family due to shortage of grasses. The area about one hectare has

been developed with the implementation of watershed development project by planting improved variety of grasses. Now sufficient green fodder is available in the area.

The WDT members of respective area have informed that now the farmers are having Jersey cows and per day milk production has increased from 4 to 6 ltrs in each case. The beneficiaries have become able to earn additional income and their economic condition has improved.

3.6.3.2 Different improved varieties of fodder plants like mulberry, lucaenia and improved grasses like napier, setaria etc. with a total cost expenditure of Rs. 6000/- have been planted in one ha. land of the village Bharan micro watershed Kathli Bharan district Sirmour to meet out the required green fodder. With the implementation of this the sufficient green fodder is available to the 5 families and milk production have increased.

3.6.4 Afforestation:

Afforestation is also an important component under watershed management since it is linked with livelihood promotion. In the ridge area, afforestation is done to slow the velocity of rain water and also to check the soil erosion. Under this component the plantation work is taken up in the watershed areas to increase the vegetation cover in identified areas. Apart from moisture conservation, the focus has remained to enhance the fodder quantity in the identified areas. In majority of the cases, fodder plants have been sown to meet the requirement of fodder as well as fuel wood. An overview of the positive achievements can be depicted through two success stories:

3.6.4.1 In watershed Dhalot, District Hamirpur, the plantation of fodder and medicinal plants have been done by spending an amount of Rs. 68000/-.

With the plantations under watershed areas the availability of fodder has increased in village Khandera, Narsi, Bafri and moisture conservation has also increased. The fodder production has also increased resulting in increase in the milk production in the area.

3.6.4.2 Under afforestation component, 15000 species of fodder plants have been planted in 7 ha. area of village Darokar and Serad Nehra district Mandi under Watershed project –V. All these plants had survival rate up to 80%. An amount of Rs. 31,500/- was spent on this

activity. With the plantation in the identified areas, the fodder production has increased and on the other hand the soil erosion has also been checked.

3.6.5 Agriculture Development –

This component aims to increase agricultural productivity in a sustained manner to diversify crop production. This is being achieved through construction of water harvesting tanks, water storage tanks and channels, repair of old water harvesting structures, measures to check soil erosion and conserve moisture. Under watershed development programme, sufficient conservation of water has been prioritized besides reclamation of the land to improve the agricultural and horticultural activities in rural areas. Besides this, the demonstration to adopt latest technology and improved variety of seeds are being provided to the farmers to improve the agriculture productions. Some success stories of this component are as under:

7.6.5.1 In village Dumat Bahali, Palhota Shirar, Neri Podda Khothi and Mananu in development block Sunder Nagar, District Mandi, 8 quintal quality seeds of peas and ginger have been provided to 35 families by spending Rs. 44000/-. This endeavour under the watershed project proved very useful. Good quality seeds gave better crops to the farmers and their income has also increased with the provision of this type of help.

3.6.5.2 Under watershed development project-I in Shimla district, a tank costing Rs. 40000/- has been constructed in watershed Sepur Nalha. With the construction of this tank, 5 hectare additional irrigation potential has been created. 15 families of the area have switched over to cash crops and vegetable production due to availability of water for irrigation in the respective area. By selling the vegetables and cash crops, the families are getting annual income of Rs. 30,000/- to 40,000/- in each case and the cropping pattern has also changed.

3.6.6 Horticulture Development:

The activities under this component aim to raise fruit production, diversify production and to conserve soil and moisture through establishing perennial tree crops with suitable ground cover on steep slopes which are unsuitable for arable production. The main activities are nursery raising, distribution of horticulture plants for homestead planting. Horticulture has ample potential for development in Himachal Pradesh as compared to other states. In Himachal Pradesh, the nurseries have been developed and fruit plants are provided to the farmers for growing in watershed areas. As a result, the orchards comprising fruit trees like apple, mango, citrus etc. have been developed in many watersheds.

3.6.6.1 Under watershed development program a water storage tank having capacity of 50000 ltrs water with the total cost of Rs. 45000/- has been constructed in micro watershed Dhar Chanana for Floriculture development in development block Chopal district Shimla.

By constructing the water storage tank the sufficient water has been made available for irrigation. Apart from tank the seed of flowers were provided to the 50 families for floriculture in 3 hectare area. By providing the above facilities each family is producing flowers costing of approximately Rs 50000/ to Rs. 60000/ in each season. The economic status of the benefited families has improved by this activity.

3.7 Capacity Building & Training:

Capacity building is an important aspect for successful implementation of watershed development programmes. The training about the technical and organizational aspects and application of Remote Sensing Technology for generating database is provided to all the functionaries involved in the implementation of watershed development programme. The exposure visits to Research Stations/ successful watersheds etc. are also organized for the Self Help Groups/User Groups for demonstration of successful technologies/ practices and designs

that are useful to them. A provision of 5% amount of the project cost is earmarked for training and capacity building of functionaries.

3.8 Monitoring and Evaluation:

It is very important to monitor and evaluate works being executed in the field. The Evaluations of the watershed projects are conducted by the Evaluators empanelled by the State Government and National Level Monitors. The mid term Evaluation report of watershed project is pre requisite document for release of further installment of funds. The Mid Term Evaluations are carried out after release of 45% funds, whereas Project Evaluation is conducted after completion of the Project. The main purpose of evaluation is to assess whether projects have achieved the desired goal of sustainable agriculture and livelihood development in rural areas.

A few Evaluation Reports of the watershed programmes by Independent Evaluators are reproduced to have an overview of the impact of watersheds:

3.8.1 Integrated Wastelands Development Project, Hamirpur, Phase III

In Evaluation Report of Hamirpur- Phase III, Impact Assessment Chapter, it has been categorically mentioned by the Evaluator that with the creation of water harvesting structure, a small dam, the farmers of village Samela of Dandru Micro Watershed in Development Block Bijhri district Hamirpur have switched over to vegetable cultivation and earning sufficient income by selling the vegetables. Similarly, with the construction of two water harvesting structures in village Katoh under Micro Watershed Tarkawri & in village Chujhani under Mehal Watershed in Development Block Bhoranj, the watershed communities have started the cultivation of vegetables who are getting sufficient income. The water ponds created in Balkar, Ghelor, Ujhan and Yamuna villages of Ropari Micro Watershed under Bhoranj Block have also changed the traditional pattern of Agriculture and the inhabitants have started to cultivate the vegetables on large scale.

3.8.2 National Level Monitoring of Rural Development Programmes:

Ministry of Rural Development, Government of India has introduced the concept of National Level Monitoring during 2003 through empanelment of National Level Monitor (NLM) chosen from amongst the retired civil servants and the officials of the Armed Forces. Each NLM is allotted one district for monitoring of Rural Development Programmes against qualitative and quantitative indicators. In the report published in October 2005, it has been highlighted that the

soil water conservation activities in micro watershed Kanoh and Tikker Rajputan district Hamirpur have helped in maintaining the water table and traditional local resources.

3.8.3 A Report by National Level Monitor:

Similarly, in the Evaluation report of implementation of watersheds in respect District Shimla, a special reference of watershed Kanohar has been given wherein successful implementation of the programme has been appreciated, reproduced in the box below:

Box: Watershed Kanohar, District Shimla

"The watershed Kanohar programme is working well and contributing towards its objective of water harvesting and soil conservation. It is worth mentioning that Shri. Sunder Lal Verma of Saroj Village has availed tremendous benefits from ongoing watershed programme which increased production of his apple orchard by diversifying his horticulture activities to three other species. As per Sunder Lal, his orchard used to suffer due to drought conditions and now has got sufficient soil moister content evenly spread through out the year due to percolation tanks. Successive gully plugs/check dams constructed in his garden, have prevented soil erosion to a greater extent leading to leveling of uneven surfaces, which resulted in providing him more space for further plantation."

3.8.4 Case Study on Physical Achievements:

With the implementation of watershed development programmes, the irrigation potential has been created in watershed areas resulting change in cropping pattern. In the evaluation reports and information collected from the Implementing agencies. it has clearly been noticed that with creation of water harvesting structures in project area and providing the irrigation facilities to the inhabitant, the income of the beneficiaries has increased, substantially. To assess the impact of watershed development projects executed in different areas of the state of Himachal Pradesh, the following case studies indicating physical achievements of two different districts representing the varied geographical condition of the State, executed at different times verify the impact from the data reproduced below:

Sirmour & Bilaspur: Pre & Post Project Physical Status Comparison

Sr. No.	Items	Unit	Sirmour 1999-2003		Bilaspur 1996- 2002	
			Pre-project status	Post-project status	Pre-project status	Post-project status
1.	Ground water structures rejuvenated	No.	49	299	0	8
2.	Increase in irrigation potential	% cultivated land	29	55	30	45
3.	Depth of Water table	Meter			60-90	50-80
4.	**Area under agriculture crop**					
	(i) Area under single crop	%age	40	15	30	20
	(ii) Area under double crop	%age	50	60	20	26
	(iii) Area under multiple crop	%age	10	25	10	18
5.	Increase in cash crop production	% of the irrigated land	60	95	6	10
6	**Increase in yield/ha.**					
	1. Peas	Kg/Per ha.	1080	1400		
	2. Potato	Kg/Per ha.	5000	9000		
	3. Wheat	Kg/Per ha.	900	1200		
	4. Tomato	Kg/Per ha.	15000	20000		
7.	Increase in horticulture crop	%age	2	15	10	25
8.	Increase in area under vegetation	% of the irrigated land	12	35	5	15
9.	Increase in fodder production	%age	16	40	10	25
10	Increase in milk production	%age of total	-	-	60	75
11.	**Number of Coop. thrift groups**					
	Self-help group	No.		146		
	User Groups	No.		298		
12.	Ancillary activities like fishery, poultry, rural	-	-	Floriculture,	-	-

	craftsmanship			packaging boxes, cash crops etc.		
12.	People below poverty line	%age	54	20	30	22
13.	Number of migrating people	Nos.	Skilled labourers in construction	Nil (only temporary migration is seen in skilled construction labour)	25	15

3.8.5 Other Positive Points

The other common positive points and shortcomings pointed out in the different evaluation reports are as under:

- Under Watershed projects, the area hitherto which was unavailable for cultivation owning to overgrowth of lantana bushes was brought under cultivation with the removal of these bushes.

- The land and water development activities have significantly improved the soil moisture conservation and thereby improving the crop yield in all watersheds. There was a significant increase in crop production.

- The velocity of runoff water is being checked to greater extent allowing the water to percolate in soil
- The flow of soil particles i.e. sand silt and clay is being checked and started accumulating.

- The quality work of construction of check dams, kuhals and field channels has been found to be good and there has been no case of complaints in this regard. The construction of kuhal/field channel has resulted into increase in the agricultural production especially cash crops like tomatoes, peas and other off-season vegetables which is evident from the increase in the production as well as increase in the per hectare yield brought.

- The general findings observed in almost every case include the points mentioned below:

- Good quality Check dams, vegetative barriers, bench terracing are constructed for the water and moisture conservation
- Water storage tanks, irrigation water channel, farm ponds have been constructed and water potential have been created in project areas.
- Visible plantation has been undertaken to augment the pastures and to fulfill the fodder requirement.
- Adequate representation to the women has been provided.

Constraints & Challenges:

- It has been observed that the soil conservation activities have not been linked with livelihood. Thus the impact of these activities in majority of cases is not visible.
- Training and capacity building of the members of WC/WA needs greater attention.
- While locating civil engineering structures, more technical guidance is needed.

4.0 Overall Achievements:

In Himachal Pradesh, 1837 micro watersheds have been identified with a total outlay of 5.298 billion INR (106 million USD) for treatment of 8,54,386 hectare of land (15.34% geographical area) in all 12 districts of the state. The programme was started in 1995-96 and till Jan. 2009, an area of 4,57,609 Hectares have been treated with the total expenditure of 2.864 billion INR(57.28 million USD) . (One US $ is equivalent to 50 Indian rupee) The component wise break-up of the achievements are as under:

Component	**Activity**	**Expenditure in Crore Rupee 1$=50 rupee**	**No. of Structures created**	**Improvement of Area (in Hect.)**		
				Irrigation	**Afforestation**	**Agriculture/Horticulture/Pastures**
Water harvesting structures	Check Dams	38.66	12842	31,000		
	Ponds/Percolation Tanks	22.00	7581	8375		
	Minor Irrigation Schemes/Kuhals	25.52	1800	2700		
	Tanks/Percolation	13.95	3102	6200		

	Well/Bawries	5.56	1657	800		
	Roof top water harvesting Structures	4.25	1841	400		
	Snow harvesting Structures	0.53	18	-		
Soil Conservation	Crate work, Gully Plugging, Trenches, Spurs etc.	55.17	22068			33841
Afforestation	Plantation Works	27.32	-		55512	
Pasture Development	Plantation of improved varieties of grasses	10.58	-			25720
Agriculture Development	Distribution of Hybrid Seeds & Extension services	26.00	-			6580
Horticulture Development	Distribution of fruit plants & nursery raising	13.96	-			25049
Training & Administration	Capacity Development	42.93				
Total		286.43 Crore				

4.1 Overall Impact and outcome of Participatory Watershed Management:

4.1.1 Increase in production of vegetables:-

The most significant and remarkable change which could be noticed in the project areas, is in the cultivation of vegetables. A well diversified Farm economy has developed rapidly during the one and half decade of watershed implementation. The implementation of watershed has led to creation of additional 49475 hectare of area under irrigation(Additional 10.81% area). Out of this nearly 18,500 hectare area has been brought under vegetable production , which was earlier under the

foodgarins production. Thus, the farmers have moved from subsistence level farming to cash crop farming. The main vegetables produced by the farmers are Peas and Tomatoes. The vegetable production has increased from 6,27,000 MT in 1995-96 to nearly 9,29,976 MT in 2005-06. in the State(Eleventh Plan Document). In the watershed project areas the production of vegetables has increased nearly by 1.95 lakh tons.

4.1.2 Boost to Horticulture:-

The horticulture activities have also got a boost in the Watershed areas and total area under fruit plants has increased by 25049 Hectare. The main horticulture crops grown are Apple, Mango and citrus fruits. The production of horticulture crops has increased by nearly 75000 tones in the project areas, due to various Watershed interventions.

4.2.3 Increase in Fodder and Milk Production:-

Watershed interventions have brought nearly 25720 Hectare area under pastures and Fodder plantation. In forest areas also the fodder plantation has been done. Due to the increase in fodder production, the dairy sector has got a boost and milk production in the State has increased from 714 thousand tones in 1997-98 to 873 thousand tons in2007-08.(Annual Plan Document 2009-10, Planning Department, Government of H P). The major portion of this could be attributed to the Watershed activities in the State.

4.2.4 Increase in Agriculture Productivity, due to preservation of soil:

The soil conservation works taken up in the project areas have successfully reduced the velocity of water leading to preservation of fertile soil and has also helped in recharge of the ground water. These interventions have helped in maintaining the productivity of the Agriculture and Horticultures produce in the State. In fact, the productivity improved considerably in most of the project areas due to protection of fertile soil and also due to retention of moisture in soil.

4.2.5 Increase in cropping intensity :-

With the implementation of watershed development programmes, adequate irrigation potential have been created in watershed areas resulting into increase in cropping

intensity. In the evaluation reports and information collected from the Implementing agencies, it has clearly come forth that now farmers are taking two to three crops in the project areas.

4.2.6 Diversification in Agriculture:

Due to creation of rain water harvesting structures such as Check Dams/Ponds/Tanks/wells etc, irrigation facilities have been provided to the dry lands. Consequently the traditional Agriculture system has switched over to cash crops. Tangible increase in Agriculture/ Horticulture production has been noticed in the project areas. Significantly the area under foodgarins have reduced from 8.37 lakh hectare in 1995-96 to 7.92 lakh in 2005-06 in the State, and there is a corresponding increase of 45,000 Hectare area of Horticulture and vegetable crops. It was observed that the water from irrigation tanks is being utilized for production of crops like ginger, potato, peas, tomato and fruit plants.

4.2.7 Revival of Water Resources:

As per information collected from the Project implementation Agencies 1628 traditional drinking water bodies have been revived. Watershed committees have renovated the traditional well/ bouries by constructing walls and gates. The water from these sources is being used for drinking purposes by animals and human beings.

4.2.8 Regeneration of Natural Resources:-

The project areas have followed ridge to valley approach for regeneration of natural resources. Forest plantation was done in the Ridge area along with soil conservation works. The low lying areas were covered with water harvesting structures and horticulture plantations. All these measure have led to regeneration of natural resources in the project areas.

4.2.9 Sustainable livelihood:-

The increase in agriculture and horticulture production has changed the life style of farmers in project areas. The per capita income of farmers has increased substantially due to shift to cash crops and income from sale of milk. The most important part is that these positive changes are sustainable because they are based on regeneration of natural resources in the

watershed areas. Farmers are now less dependent on the vagaries of weather and could get their livelihood in a sustainable manner

5.0 Future Strategy:

- The benefit of watershed approach has been amply demonstrated in the State. The State Government has recently prepared a perspective plan of Rs. 4668 Crore Indian Rupee(933.6 million USD) to cover all the remaining areas i.e. 31.12 lakh Hectare, in a phased manner, which require intervention under Watershed projects.

- Based on the experiences of implementation of watershed management project in the State and elsewhere in India, the perspective plan proposes to use watershed development as an opportunity to combine and integrate water conservation with livelihood concerns. Enhancing sustainable livelihood options of the people will be the key objective in Watershed Management activities. Advocacy will be done on dissemination of Watershed approach as the best alternative for poverty alleviation since it attempts to harvest the water for irrigation facility which results in increase in agriculture and fodder production, ultimately resulting into sustainable livelihoods.
- The emphasis will be on strengthening and enhancement of genuine participative democracy at the grass roots. Participation is seen as a means to enable and empower the local community to make informed choices.
- The Government of India has enacted the National Rural Employment Guarantee Act 2005which guarantees 100 days of employment in rural areas. The funds provided for implementation of this Act are also being utilized for construction of water harvesting structures, in addition to creation of employment in rural areas.
- The state government proposes to enhance provision under watershed projects, from Rs. 6000/- to Rs. 15,000/- per hectare for full regeneration of natural resources in these areas.

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Gestion intégrée de l'eau par bassin versant :

Mobiliser les intervenants, la clé du succès

Présenté dans le cadre du Rendez-vous international sur la gestion intégrée de l'eau

Par Louis Ménard, Union des producteurs agricoles

Sherbrooke, le mardi 2 juin 2009

Plan de la présentation

- **La gestion de l'eau en milieu agricole : les grandes étapes**
- **La réalisation d'un projet de gestion intégrée de l'eau par bassin versant**
- **Les facteurs de réussite**
- **Les facteurs d'échec**
- **Conclusion**

La gestion de l'eau en milieu agricole : les grandes étapes

Un premier pas vers l'assainissement

- **1978 : lancement du Programme d'assainissement des eaux du Québec**
  - **Secteurs municipal (8 G$), industriel (secteur Pâtes et papier 1,5 G$) et agricole (950 M$)**

Et la réduction de la pollution diffuse

- **1988 : Programme d'amélioration de la gestion des fumiers (PAGF)**
- **2005 : Programme Prime-Vert (volet 10), réduction de la pollution diffuse agricole**

Depuis 20 ans, l'essentiel des efforts consentis a porté sur le contrôle de la pollution ponctuelle et certaines mesures de contrôle de la pollution ponctuelle.

L'approche par bassin versant

- **1990 : premières initiatives de l'approche par bassin versant**
  - **Financement de deux projets-pilotes au Québec**
    - **Bassin versant de la rivière Saint-Esprit (Lanaudière)**
    - **Bassin versant du ruisseau Turmel (Beauce)**
  - **Autres initiatives**
    - **Groupe d'intervention pour la restauration de la rivière Boyer (Bellechasse)**
    - **Rivière Fouquette (Côte-du-Sud)**
    - **Ruisseaux Corbin et des Trentes en Montérégie**

Les projets se multiplient

- **2002 : lancement de la Politique nationale de l'eau avec comme orientation la gestion intégrée de l'eau par bassin versant**
- **2004 : mise en œuvre des projets WEB, sept projets-pilotes à travers le Canada dont un au Québec (bassin versant de la rivière Bras d'Henri)**
- **2005 -2010 : Programme de mise en valeur de la biodiversité des cours d'eau en milieu agricole, FFQ et UPA (10 projets, 500 producteurs)**

Concertation et cohabitation

- **2007 -2010 : Plan d'action concerté sur l'agroenvironnement et la cohabitation harmonieuse (10 projets, 500 producteurs), MAPAQ, MDDEP et UPA**
- **2008-2018 Plan d'amélioration de la qualité de l'eau en milieu agricole (algues bleu vert), gouvernement du Québec, 145 M$, d'ici 2018, environ 20 000 fermes seront visées**

En résumé

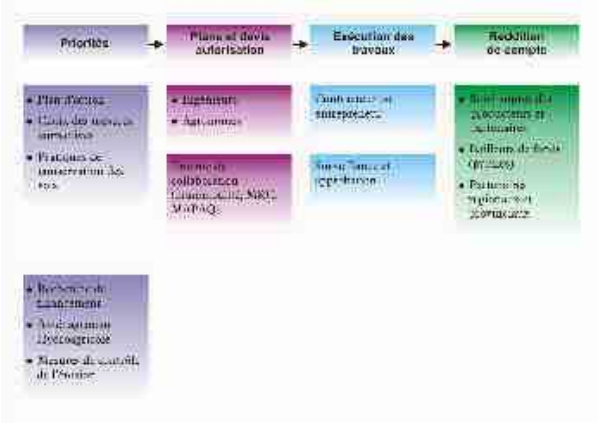
- **Une soixantaine de projets de gestion intégrée de l'eau dans les petits bassins versants sont actuellement en cours de réalisation**
- **Au fil des ans, une solide expertise s'est développée (ex. : rivière aux Brochets, ruisseau Walbridge, rivière LaGuerre)**
  - **IRDA**
  - **les facultés d'agriculture McGill et Laval**
- **Accompagnée d'une aide financière gouvernementale spécifique pour cette approche (Programme Prime-Vert)**

La réalisation d'un projet de gestion intégrée de l'eau par bassin versant

La planification d'un projet de gestion intégrée de l'eau par bassin versant exige beaucoup de temps, d'énergie, des habilités techniques, organisationnelles et d'animation de groupe.

Réalisation de projets de gestion de l'eau par bassin versant en milieu agricole

Réalisation de projets de gestion de l'eau
par bassin versant en milieu agricole



La gestion de l'eau en milieu agricole : les facteurs de réussite

Projets qui émanent du milieu

- **Appui des organismes du milieu**
  - **syndicat de base, clubs conseils en agroenvironnement, Caisse populaire, municipalités, groupes de protection de l'environnement et de la faune**
- **Implication et participation des représentants des ministères et municipalités**
  - **permet de diminuer la lourdeur administrative**
  - **deviennent des facilitateurs**

Projets à l'échelle de petits bassins versants

- **Superficie du territoire du bassin versant inférieure à 100 km2**
- **Nombre de producteurs inférieur à 100**
- **Faciliter la mobilisation du milieu**
- **Créer un plus grand sentiment d'appartenance**

Projets appuyés par des ressources techniques

- **Approche multidisciplinaire = bonne connaissance du bassin versant**
  - **problématiques (qualité de l'eau)**
  - **potentiel faunique (ex. cahier de propriétaire et diagnostics spécialisés)**
  - **expertise technique (génie hydraulique et agronomique)**

Projets appuyés par des ressources techniques

- **Outils permettant de réaliser un suivi (aménagements hydroagricoles, qualité de l'eau, benthos, inventaire piscicole, aviaire, etc.)**
- **Suivi des aménagements sur le terrain des années après leur implantation (ex. : aménagements hydroagricoles, etc.)**

Projets appuyés sur le plan financier et administratif

- **Appui financier de l'État pour :**
  - **la coordination des projets**
  - **la réalisation d'aménagements hydroagricoles**
- **Projets clé en main :**
  - **réduire la paperasse et les délais**

Un pilier indispensable : le ou la chargé(e) de projet

- **Leadership et bon communicateur :**
  - **animateur et rassembleur des intervenants et des producteurs**
  - **aptitude à travailler en équipe avec les intervenants du milieu (agronome, ingénieur, biologiste, géomaticien)**

Un pilier indispensable : le ou la chargé(e) de projet

- **Vulgarisateur :**
  - **connaissance de l'approche de gestion de l'eau par bassin versant et des pratiques agroenvironnementales**
- **Planificateur :**
  - **suivi des projets**
  - **Permanence reliée au poste**

Les communications : autre élément clé de la démarche

- **Rencontre de groupe et individuel**
- **Outils de communication pour :**
  - **informer et mobiliser l'ensemble des partenaires**
  - **faire connaître les efforts du milieu auprès de la population**
  - **valoriser le travail accompli**
  - **créer un effet d'entraînement auprès des producteurs et des partenaires locaux**

Coordination provinciale

- **En appui aux chargés de projets**
  - **Programme de formation et transfert de connaissance**
  - **Forum d'échange et partage d'information**
  - **Développement d'outils de gestion à des fins de planification et de suivi des projets**

Autres conditions gagnantes

- **Appui d'un comité de direction constitué de producteurs agricoles impliqués dans le projet et dans le bassin versant**
- **Équipe d'intervention sur le terrain pour la réalisation des travaux d'aménagements hydroagricoles**
- **Accès à des services régionaux spécifiques (ex. : service d'entretien de la zone riveraine)**

La gestion de l'eau en milieu agricole : les facteurs d'échec

- Projets parachutés ou imposés
- Roulement de personnel
- Financement inadéquat
- Absence :
  - d'engagement financier et de soutien à long terme
  - de reconnaissance du milieu
  - d'appui technique et de coordination
  - de transfert de l'expertise et d'encadrement des chargés de projets
  - de recherche et développement et de veille technologique

Conclusion :

Le Québec connaît actuellement une phase de développement de l'approche de la gestion intégrée des cours d'eau en milieu agricole.

Nos besoins

- **Appui de l'État :**
  - **une véritable politique d'assainissement pour contrôler la pollution diffuse**
  - **un engagement financier à long terme**
  - **La réduction de la lourdeur administrative (permis et autorisations)**

Nos besoins

- **Expertise technique :**
  - **hydrologie et génie pour l'implantation d'aménagements hydroagricoles**
  - **formation et encadrement adéquats des chargés de projet**
  - **intervention plus audacieuse telle que le génie végétal**
  - **outils de gestion géomatiques**
  - **accessible dans toutes les régions**

Nos besoins

- **Transfert et suivi**
  - **auprès des conseillers et des producteurs**
  - **attention particulière sur le développement de service d'entretien de la zone riveraine**
  - **outils de suivi et indicateurs de qualité de l'eau et faunique**
- **Reconnaissance**
  - **mobilisation des producteurs et des partenaires du milieu**

Merci !