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Brief outlook of objectives and programs of Watershed development in Karnataka

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Abstract

Protection of natural sources: maintain and enlarge available inexperienced spaces, seashores, natural water courses and the Niagara Escarpment for destiny generations. Reforestation of the town: sell the replanting and control of flora on private and public belongings within the town. Ecosystem Auditing: town ought to prepare an objective ecosystem audit of the whole municipality at regular intervals. 1)size and form 2)topography 3)soils b)climatic function 1)precipitation 2) amount and intensity of rainfall c)Watershed operation d)Land use sample 1) vegetative cowl 2) density e) Water resource and their abilities f) Geological factors. Karnataka is predominantly a rural and agrarian state. Agriculture performs a key function in state's economic system. Karnataka has given an important region for Watershed improvement, because, 75% of the cropped vicinityin Karnataka relies upon low and unsure rainfall. It has a geographical region of a 190.49 Lakh ha. Net cropped vicinity is 107.90 Lakh Ha. Out of this 23.20 Lakh ha. Is irrigated and 84.79 Lakh ha. This rainfed place is with none prospect of ever being capable of obtain any kind of command irrigation facilities. The country depends on dry land for greater than 1/2 of its food production. In view of the above scenario more emphasis is given for dry land farming within the country by manner of growing dry land areas on watershed foundation.

Key words : Watershed, NABARD, Metrological, Bio system, WDC-PMKSY, NWDPRA, Conservation of rainwater.

Improvement is a holistic method to construct and support the basic sources, so that it will permit the establishment of sustainable existence help. That is an incorporated approach on a natural hydrological unit, "a watershed". Watershed is a hydrological entity that covers a selected location increased on land surface, inside whose obstacles the complete rainfall run-off in the long run passes through a in particular defined circulation. So, it's far a unit of land on which all water that falls collects by means of force of gravity, runs thru not unusual outlet. It's miles as a result an area of land that contributes run-off to a

not unusual point and is separated from adjacent regions by means of a herbal ridgeline[4]. Sing[5] has defined watershed as a geographic region drained by circulate of connecting streams such that all precipitation in this vicinity leaves the place in a focused drift via a single outlet. Watershed, as a herbal unit of environment planning and improvement, is widely used in maximum of the international locations. It has a huge spectrum of traits like Watershed topography which include mountains, hills, plains, gullies, valleys and so forth. Every is characterized by means of variable slope and the vicinity, from one region inside the Watershed to the alternative place.

Land mass consists of land use, soil kind and underlying geology. Meteorological elements include rain, evaporation, radiation, wind, temperature and many others. Flowers entails agriculture, forestry and agro-forestry. These sources are interdependent and in the end control of these factors is determined with the right consideration of ecological and socio-monetary elements. Watershed improvement project is aimed at conservation of natural assets and retaining the ecological development of the vicinity with the aid of the use of the easy soil and water conservation techniques. Broadly there are 5 specific watershed programmes operating within the use of a which vary in terms of water keeping strategies, management, planning and environment composition. The primary institution consists of Operational studies projects (ORP) taken up by ICAR at specific locations. Secondly, world bank financed watershed projects; thirdly is kingdom authorities subsidized watershed initiatives. Fourthly important government assisted a countrywide Watershed development Programme (NWDP) which become carried out by using each kingdom authorities with a few modifications. The 5th one is watershed tasks undertaken with the aid of the non-government companies 'Sujala', a watershed development project advanced by the government of Karnataka and applied by using the Watershed improvement branch of government of Karnataka with tripartite cost sharing preparations. The world financial institution thru international development association affords major part of the plan outlay. The authorities of Karnataka finances some portion of the price range and the watershed groups make contributions a few component. Sujala watershed is a network pushed watershed improvement task and is being applied in 3 levels. Within the first segment (2001-2006) the mission became applied inside the region of 4.29 lakh ha covering five districts (Chikkaballapur, Tumkur, Chitradurga, Haveri and Dharwad) with the financial assistances of global financial institution. At some stage in the second phase (2007-2012) 1.Fifty six lakh ha turned into handled in six districts (Belgaum, Madikeri, Hassan, Chitradurga, Chikamagalur and Shimoga) with the economic assistances of NABARD. In the third phase (2013-2018) the undertaking is proposed to treat 2.Fifty three lakh ha in Seven Districts (Bidar, Gulbarga, Yadgir, Gadag, Koppal, Davanagere, Chamarajanagar and untreated areas of Chitradurga and Tumkur) with the financial help of global bank.

The watershed management is designed with the following goals :

- To reduce the danger designed with the following objectives.

- To govern negative runoff and degradation and there by conservation of soil and water.
- To manage and utilize the runoff water for the beneficial purpose.
- To guard, conserve and improve the land of a watershed for extra green and sustained manufacturing.
- To protect and enhance the water resources originating in the watershed.
- To check soil erosion and decrease the impact of sediment yield on the watershed.
- To moderate infiltration of rainwater.
- To enhance and boom the production of timbers, fodder and wildlife resources.
- To decorate the groundwater recharge, wherever relevant.

Watershed control :

Watershed control is the technique of guiding and organizing the use of the land and other sources in a watershed to provide preferred items and services without adversely affecting soil and water resources. Every mission underneath the programme is a micro-degree effort to acquire this goal by way of treating the beneath productive or unproductive land and taking up allied sports for the gain of the landless. The programmes adopt a not, unusual method of multi resource control related to all stakeholders in the watershed who, collectively as a set, co-operatively discover the aid problems and issues of the watershed as well as increase and put into effect a watershed plan with answers which can be environmentally, socially and economically sustainable.

Watershed control programmes in India :

To accelerate the tempo of improvement of wastelands/ degraded lands the government had set up the national Wastelands Development Board in 1985 underneath theMinistry of surroundings and Forests. Later a separate department of Wastelands development within the Ministry of Rural improvement and Poverty remedy turned into created in 1992 and the country wide Wastelands development Board become transferred to it. In April 1999, branch of Wastelands development became renamed as the branch of Land assets to act because the nodal business enterprise for land resource management. Therefore, all land-based development programmes and the Land Reforms division were added under this branch. Drought prone regions Programme (DPAP), wilderness improvement Programme (DDP) and integrated Wastelands improvement Programme (IWDP) have been the watershed control programmes carried out by way of the branch.

To accelerate the tempo of improvement of wastelands/ degraded lands the government had set.

Later for maximum use of resources, sustainable results and incorporated making plans, DPAP, DDP and IWDP were consolidates because the Watershed development element of high Minister Krishi Sinchayee Yojna (WDC-PMKSY).

Prime Minister Krishi Sinehayee Yojna (Watershed improvement aspect) (WIC-PMKSY) :

The primary targets of the WDC-PMKSY are to repair the ecological stability by means of harnessing, keeping and developing degraded natural assets including soli, vegetative

cowl and water. The consequences are prevention of soil erosion, regeneration of natural plant life, rain water harvesting and recharging of the floor water table. Thispermits multi-cropping and the advent of numerous agro-based activities, which help to provide sustainable livelihoods td the people residing within the watershed area.

The salient features of wdc-pmksy :

Setting up of committed establishments with multi-disciplinary experts at state stage - kingdom stage Nodal company (SLNA), District level - Watershed cell cum records Centre (WCDC), project level - project enforcing agency (PIA) and Village stage - Watershed Committee (WC).

- Cluster method in choice and guidance of tasks: common length of undertaking-approximately 5,000 ha.
- Enhanced value Norms from Rs. 6000 according to ha. To Rs. 12,000/ha. In plains; Rs. 15,000/ ha in tough/ hilly areas.
- Uniform funding sample of ninety: 10 between Centre & States.
- Releaseof significant assistance in three installments (20%, 50% &30%) in preference to 5 installments.
- Flexibility within the task length *i.e.*, 4 to 7 years.
- Clinical planning of the projects with the aid ofthe use of IT, faraway sensing techniques, GIS centers for making plans and tracking & assessment.
- Earmarking of project price range for DPR preparation (1%), entry factor activities (four%), ability constructing (5%), tracking (1%) and evaluation (1%).
- Introductionof recent livelihood thing with earmarking of venture fund under Watershed projects *i.e.*, 9% of mission fund for livelihoods for assetless humans and 10% for production system & micro-businesses.
- Delegation of electricity of sanction of initiatives to States.

Standards : Guide responsible development that promotes efficiency and enhances thesatisfactory of existence. Protect the environment in each a proactive and remedial manner, with emphasis on anticipation and prevention. Make decisions that apprehend the interdependence of people and nature in a not unusual atmosphere. Sell responsible aid use and conservation practices. Have regard for environmental, financial and social costs and blessings in the development and use of sources, products and services. Sell accountable stewardship to ensure equitable use of natural and environmental sources a good way to meet important desires of each present and destiny generations.

Objectives : Protection of natural sources: maintain and enlarge available inexperienced spaces, seashores, herbal water courses and the Niagara Escarpment for destiny generations. Reforestation of the town: sell the replanting and control of flora on private and public belongings within the town. Complete Public Participation in development decisions: allow the general public to be a part of all planning decisions, Financial, environmental and social affectsof proposed developments ought to be considered. Actively sell Sustainable development: endorse adjustments at the senior degrees of authorities, as well as inside the metropolis, for youto evolve toward

sustainability. Make the first-rate Use or Land: Land-use choices primarilybased upon an ecosystem approach to ensure environmental integrity and variety. To include, however now not be confined to, selling environmentally sensitive lands and the use of fertile soil for agriculture throughout the municipality.

Safety and Enhancement of herbal features: protect and decorate Burlington's herbal features through ensuring that the bodily capabilities of shorelines, agriculture lands, flood plains, forestry tracts and terrific landmarks inclusive of the Niagara Escarpment are preserved for destiny generations. Natural typhoon Water management: protect water guides in their natural nation and for the ones water guides that have been significantly altered, recovery to a more herbal state can be endorsed as opportunities rise up.

Balanced improvement: provide a community plan and an economic strategy aimed toward developing sustainable and suitable varieties of development that replicate human scale and a sense of network in addition to representing a balance among city improvement and herbal surroundings. Green city design: boom the efficiency of land use inside the city community in phrases of energy and time, sell intensification and diversification policies as opposed to guidelines that generate urban sprawl.

Minimal discharge of toxic insecticides and different poisonous chemicals: sell the removal of personal and public use of poisonous insecticides and other chemical compounds that have negative effects on the environment, especially the ones acknowledged to be persistent. Accessible community development: shape a brand new type of community improvement which incorporates readily to be had local network additives such as commerce, shopping, employment, schooling and activity within strolling distance of all residences.

Accountable use of herbal resources: encourage conservation of natural sources, the town should paintings towards making sure that customers are charged for the overall neighborhood costs in their character use of water, power and natural resources. Integration of herbal functions and green area; combine herbal features and inexperienced space in all new tendencies and intensification tasks. Electricity Conservation: sell strength conservation via green land use planning and constructing layout.

Ecosystem Auditing : town of Burlington ought to prepare an objective ecosystem audit of the whole municipality at regular intervals. Balanced Transportation system: broaden a balanced transportation machine which include transit, pedestrian, and biking facilities and excellent use of the road device for motion of products and people, with the prevailing centers used to their fullest ability. Assessment of improvement: continuous monitoring and assessmentof improvement have to take place to make certain that it does no longer have unfavorable influences at the city's budget and the surroundings.

Watershed management and improvement :

1. The watershed boundary will extra or less follow the best ridgeline around the circulation channels and meet the bottom factor at the land where water flows out of the watershed the mouth of the water way.

2. A watershed is surely the geographic location thru which water flows throughout the land and drains right into a commonplace frame of water, whether or not movement, river, lake, or ocean creation.

3. Wholesome watersheds are also essential for the very sustenance of human existence.
- In keeping with the Environmental safety corporation, extra than $450 billion in meals, fibre, manufactured goods and tourism relies upon on clean, healthful watersheds.
- Watersheds are essential because the floor water features and typhoon water runoff within a watershed ultimately drain to different bodies of water. It is crucial to consider those downstrearn influences when growing and imposing water quality protection and recuperation moves.

Importance of watershed :

4. It is an incorporated and multidisciplinary approach.
- The watershed control and exploitation have to no longer have any unfavorable results on soil and water sources.

5. Watershed control is described as the system of formulating and carrying out direction of action concerning manipulation of natural, agricultural and human sources of a watershed to offer assets that are preferred by means of and are appropriate to the watershed network.

Watershed Management :

6. Utilizing the land based totality on its functionality.
- Water harvesting for supplemental irrigation.
- Creation of take a look at dams for increasing floor water recharge.
- In situ conservation of rainwater.
- Minimizing putting in place of tanks, reservoir and decrease fertile land,
- protective fertile pinnacle layer soil.
- principles of watershed control

Elements of Watershed Management :

a) Watershed characters 1) size and form 2) topography 3) soils
b) climatic function 1) precipitation 2) amount and intensity of rainfall
c) Watershed operation
d) Land use sample 1) vegetative cowl 2) density
e) Water resource and their abilities
f) Geological factors

7. To defend and decorate the miter useful resource originating inside the watershed.
- to improve and increase the manufacturing of timbers, fodders and wild life useful resource.
- to guard, conserve and improve the land of watershed for extra green and sustained manufacturing.
- to check soil erosion and to lessen the effect on watershed yield.
- to manage and make use of the runoff water for useful reason.
- to enhance the floor water recharge, wherever relevant.
- to increase infiltration of rain water.
- to moderate the floods peaks at down move areas.

Watershed management Practices

Sub soiling.
- Strip cropping.
- Grassed waterways.
- Bench terracing.
- Graded bonding or channel terraces.
- Contour bonding.
- Sorts of Watershed control.

9. Technique for watershed control & the whole setup for the watershed control follows a hierarchical technique.
- At the same time as the principle improvement sports should be performed by way of the watershed network itself, the overall facilitation, coordination and supervision of the complete programme will be duty of a task implementation company (PIA).
- Human beings participation is the important thing to watershed improvement programmes.

10. Coaching of watershed improvement plan consists of two predominant steps:

1. Identification of watershed issues and putting in place of goals and priorities primarily based on diverse surveys of watershed.
2. Formula of proposed improvement and management plan.

Steps for instruction of watershed improvement Plan :

11. Financial aspects.

- Socio-financial elements.
- Environmental aspects.
- Hydrological elements.
- views of watershed development

12. Use of extra fertilizer and pesticides decreased soil fertility.
- woodland hasbeen reduce all the way down to make way for agriculture. This prompted rapid soil erosion.
- Groundwater tables are falling and most wells run dry within the long summer time months.
- Farm productivity is low in view that water is available only 3 to four months inside a yr.
- around 1/4 of all farmland is rain fed and there's nevertheless little scope to amplify irrigation.
- Karnataka is the driest country in India after Rajasthan. Massive country of the area are subjected to droughts.
- want for watershed development in Karnataka

13. Karnataka watershed development project (KWD)

- World bank assisted sujala watershed undertaking.
- Western ghat development programme (WGDP)
- Included watershed development programme (IWDP)
- Drought prone areas development programme
- River valley challenge
- Country wide watershed improvement programme for rain fed areas (NWDPRA)
- Watershed development Programs in Karnataka.

Figure 1. Watershed development in Karnataka

Contour Bunding :

- Contour binding consists of building slender-primarily based trapezoidal earthen embankment at intervals along the contour to impound run off water at the back of them so that every one the stored water is

absorbed progressively into the soil profile for crop use.
- A chain of such builds divide the vicinity into strips and act as barrier to the flow of water.

Graded Bunding :

- These are built where the extra water is to be eliminated effectively to keep away from water stagnation, In these water flows in graded channel built on the upstream facet of the builds at non erosive velocities and is led to safe stores.

Bench-Terracing :

- It is practiced on steep hill slopes starting from sixteen- 33%.
- Bench terracing which involves changing-theunique ground into level step like fields constructed by means of half reducing and half of filling, facilitates in significantly lowering the diploma of slope.

Grassed Waterways :

- Those are related to channel terraces for secure disposal of concentrated run-off, thereby protecting the land towards rills and gullies.
- A waterway is constructed consistent with a right design and a vegetative cowl is hooked up to defend the channel in opposition to erosion because of concentrated waft.

Strip Cropping :

- Strip cropping consists of a series of alternate strips of diverse varieties of crops laid out so that each one tillage and crop management practices are achieved across the slope or at the contours.
- Strips of erosion -allowing plants are always separated by means of strips of near growing or erosion resisting vegetation.

Sub-Soiling :

- This approach includes breaking with a subsoil the tough and impermeable subsoil to conserve greater rain-water by way of enhancing bodily situations of the soil.

20. The evaluation turned into performed covering 3 outcomes

a) manufacturing or monetary advantages,
b) social impacts/employment generation,
c) environmentalinfluences,

- carried out below national watershed development programme for ruin fed regions (NWDPRA) for the duration of 1997-98 to 2001-02 with ninety% important government fund
- the suggest annual rainfall (24 year's common) is 817mm, so watershed was in particular selected to conserve rainwater, to control erosion in arable lands and to increase crop productivity.
- An try has been made to evaluate the long time impact of watershed development programme in Mastihalla watershed of Bellary district.

21. Growing in common productivity of kharif crop groundnut from 2.34 quintals/ha to six.95 quintals/ha

Home of micro plans for land treatment are generated as a end result 21% of land owned by the KAWAD farmers turned into irrigated.

In Karnataka, Chitradurga district is selected for following purpose:

1) This is semi arid and backward districts with 460.797 ha of area requiring watershed control,
2) Suggest rainfall in the district was 565 mm for the duration of 1901-1990 period.

Watershed improvement programme turned into carried out in Molkalmurutaluk of Chitradura underneath Karnataka improvement enterprise.

Save water Save earth :

The control of watershed gives a method to acquire sustainable land and water control.

Watershed is an critical in day after day existence, a extensive variety of activities of everyday lifestyles depends upon ok supplies of water as an example agriculture and enterprise, power production, inland transportation, sanitation and so forth. Therefore to offer a majority of these sports construction of watershed and manage is crucial.

Karnataka is predominantly a rural and agrarian state. Agriculture performs a key function in state's economic system. Karnataka has given an important region for Watershed improvement, because, 75% of the cropped vicinity in Karnataka telies upon low and unsure rainfall. It has a geographical region of a hundred ninety.49 Lakh Ha. Net cropped vicinity is 107.90 Lakh Ha. Out of this 23.20 Lakh Ha is irrigated and 84.79 Lakh Ha. israinfed area. This rainfed place is with none prospect of ever being capable of obtain any kind of command irrigation facilities. The country depends on dry land for greater than ½ of its food production. In view of the above scenario more emphasis is given for dry land farming within the country by manner of growing dry land areas on watershed foundation. All India soil and land use survey in its revised atlas in 1990 has identified 35 crucial river basins and 3237 watershed within the U.S.A. In majority of these sports construction of watershed and manage is crucial.

Karnataka's 6 rivers basins 234 watershed, 3515 sub watershed, 34,299 Micro watersheds have been diagnosed for development.

The initial impetus to watershed development in Karnataka came from Kabbalnala Watershed in Kanakapurataluk of then Bangalore rural district within the yr 1984-85. Later, 4 Dry land.

References :

1. Agriculture census, Branch of Agriculture
2. Chitradurga district website
3. Indian government sources
4. Oswal, M.C. (1999). Walershed Management (for dryland agriculture), Associated Publishing Company, New Delhi.
5. Singh, R.V. (2000). Ed. Watershed Planuning and Management. Yash Publishing House, Bikaner, Rajasthan & India.
6. Watershed Department website
7. www.google.com