

7. AGRICULTURAL ENGINEERING

1. Introduction

To usher in the **Second Green Revolution** and to increase the agricultural production, the Agricultural Engineering Department is implementing various programmes for soil & water conservation, water management, ground water recharge and farm mechanization in a massive way.

This department is taking up various schemes to prevent land degradation and to improve the soil moisture regime for better crop growth, to improve water use efficiency by judicious use of irrigation water, to generate more income per drop of water, to augment ground water potential by harvesting rain water, to improve the farm power available in the State from the present level of 1.7 to 2.0 kW / ha. by promoting newly developed farm machinery in agriculture and providing farm machinery at affordable hire charge to farmers.

2. Agricultural Mechanisation

Agricultural Mechanisation at increased pace is required to meet the challenges posed by non availability of farm workers due to rapid industrialization and urbanization and also increased cost of cultivation that may adversely affect the food security in future. Productivity of the farm depends considerably on the availability of sufficient farm power and efficient farm implements with their judicious utilization. Agricultural equipments enable efficient utilization of various inputs viz. seeds, fertilizers, plant protection chemicals and water for irrigation in addition to ease the drudgery associated with various farm operations.

2.1. Agricultural Mechanisation Programme under the Centrally Sponsored Scheme of Macro Management of Agriculture

Under the Centrally Sponsored Scheme of Macro Management of Agriculture, scheme of popularising agricultural machinery / implements in agriculture is being implemented with the financial assistance from the Centre and State Government on 90:10 basis. Under this scheme, subsidy assistance is provided to farmers to purchase Tractors, Power Tillers and Rotavators as per the norms of the Government of India guidelines. During 2012-13, subsidy assistance of ₹424 lakhs has been given to farmers to purchase 987 agricultural machinery such as Tractors, Power Tillers and Rotavators. During 2013-14, the Agricultural Mechanisation Programme is proposed to be continued with a subsidy of ₹5470 lakhs under Sub Mission on Agricultural Mechanisation of Government of India.

2.2. Agricultural Mechanisation Programme under National Agriculture Development Programme (NADP)

Agriculture activities depend on the seasonal and monsoon rains and the farmers find it difficult to carry out the land preparation, planting, weeding, plant protection and harvesting activities in time due to shortage of farm labourers.

Subsidy assistance is provided to individual farmers for purchasing the agricultural machinery such as multi crop thresher, combine harvester, paddy transplanter, rice tray nursery preparation machine (automatic), power thresher, power weeder, power sprayer, paddy reaper binder, gender friendly equipments, tractor drawn / power tiller driven

implements etc. by Agricultural Engineering Department with the following subsidy pattern.

- 50% subsidy assistance is provided to general category farmers for purchasing agricultural machinery / implements subject to the ceiling limit prescribed for each implements and a maximum ceiling limit of ₹4 lakhs to purchase high cost farm machinery.
- 60% subsidy assistance is provided to SC farmers for purchasing agricultural machinery / implements subject to the ceiling limit prescribed for each implements and a maximum ceiling limit of ₹5 lakhs to purchase high cost farm machinery.

This facilitates the farmers to take up the timely sowing, transplanting, weeding, plant protection and harvesting for the increased production and productivity. The acute farm workers scarcity is being mitigated by increased use of farm machinery. During 2012-13, subsidy assistance of ₹7344.72 lakhs has been given to farmers for purchasing of 41328 agricultural machinery / implements. It is proposed to continue the programme during 2013-14 also.

2.3. Demonstration of newly developed Agricultural Machinery and Implements

The newly developed agricultural machinery / implements such as automatic paddy tray nursery preparation machine, raised bed planter, laser land leveller, sugarcane sett cutter planter, sugarcane trash shredder, tractor operated leaf shredder, self propelled paddy transplanter, power weeder, zero till seed drill etc, are popularised among the farming community by conducting demonstrations at farmer's fields. This programme is being implemented with 100% assistance from Central Government. During 2012-13, 503 number of demonstrations of agricultural machinery and implements

have been conducted at a cost of ₹15.03 lakhs and farm implements were purchased at a cost of ₹3.38 lakhs for the purpose of conducting demonstrations. During 2013-14, it is proposed to conduct 527 demonstrations at an outlay of ₹15.80 lakhs and to purchase newly developed machinery at a cost ₹21.50 lakhs for conducting demonstration.

2.4. Training programme to farmers in the field of Agricultural Mechanisation

The training programmes on machinery and implements used for paddy and sugarcane cultivation, plant protection equipments and conjunctive use of water through sprinkler & drip Irrigation systems are imparted to the farmers. The training programmes are conducted to enable farmers in handling and maintaining the farm machinery with 100% financial assistance from Central Government. As a result of these training programmes, awareness has been created among farmers as well as rural youth regarding the operation and maintenance of newly developed machinery. During 2013-14, it is proposed to conduct 135 training programmes to farmers at an outlay of ₹35.10 lakhs.

2.5. Training to rural youth on Operation and Maintenance of the newly developed Agricultural Machinery / Implements

To popularise the use of the newly developed agricultural machinery/implements in agriculture and to improve the farm power availability, training programmes on operation and maintenance of the agricultural machinery / implements are imparted to rural youth for a period of three months. The technical know-how of the rural youth has been improved in handling and maintaining newly developed agricultural machinery / implements. Some of these trained rural youth have been given job opportunities by reputed

firms in the past years. During 2012-13, training programmes are conducted in six workshops of the Agricultural Engineering Department at Tiruvarur, Vellore, Coimbatore, Trichy, Madurai and Tirunelveli at a total cost of ₹42.90 lakhs. During 2013-14, it is proposed to continue this scheme at an outlay of ₹57.30 lakhs.

2. 6. Formation of farm workers group including free package of machinery and training on operation and maintenance of farm machinery

To overcome the hurdles due to the shortage of farm workers, that causes a serious setback to the efforts in increasing the agricultural production, it is proposed to form farm workers group and providing them the required machinery on free of cost, train them in operation and maintenance of farm machinery for taking up agricultural operations for paddy, pulses etc. on need basis. These groups of farm workers could be engaged in various farm operations by the farmers duly paying nominal charges. For this purpose, farm workers group consisting of rural youth, small and marginal farmers are formed and free package of agricultural machinery and training are provided for each group to the value of ₹15.30 lakhs. During 2012-13, 30 such groups were formed at a total cost of ₹312.05 lakhs under NADP and it is proposed to continue the scheme during 2013-14 at an outlay of ₹750 lakhs.

3. Custom Hiring of Agricultural Machinery to Farmers

3.1. Minor Irrigation Machinery

The department is having a fleet of minor irrigation machinery viz., 35 Rotary Drills, 11 Percussion Drills, 21 Mini Drills, 69 Hand Boring Sets, 7 Long Hole Equipments and 36 Rock Blasting Units for hiring out to the farmers for minor irrigation activities such as sinking of new

borewells and revitalisation of dried up open wells. Services of 12 Resistivity Meters and 3 Electrical Loggers are provided to farmers for locating well sites and aquifers.

3.2. Land Development Machinery

The department is having a fleet strength of land development machinery viz. 91 Bulldozers, 219 Tractors, 2 Hydraulic Excavators and 63 Laser Leveller Implements for hiring out to farmers at nominal hire charges for taking up works such as land levelling, land shaping, ploughing. etc. These machinery are also used for relief works during flood and natural calamities.

Besides, 51 Paddy combine harvesters and 7 Paddy transplanter are also available for hiring out to farmers. The details of machinery available for custom hiring in each district and the hire charges are furnished in the Table. The programme of custom hiring of agricultural machinery to farmers will be continued during the year 2013-14.

3.3. Online booking of Agricultural Machinery under Custom Hiring

A new simplified procedure for allotting agricultural machinery to farmers has been launched for online booking of agricultural machinery under custom hiring. This system would help the farmers to know the availability of agricultural machinery and booking from their mobile phone. This will save time in allotting the machinery to the farmers and will pave way for efficient, quick and transparent system for custom hiring.

4. Water Management

In a highly urbanised State like Tamil Nadu where agriculture land is under pressure, there is a need for intensifying efforts to improve agricultural productivity and income. Tamil Nadu has exploited nearly 80% of its water potential for irrigation. However, the water use efficiency of the conventional irrigation methods is abysmally low at about 35 – 50% only. As the industrial and domestic need of water is increasing day by day, the water availability for irrigation gets reduced. Growth in agriculture depends on increasing the efficiency and productive use of water. Hence judicious management of irrigation water has become imperative to improve water use efficiency significantly.

4.1. Command Area Development and Water Management Programme of Accelerated Irrigation Benefit Programme

The Command Area Development and Water Management Programme is being implemented in Tamil Nadu with an aim to improve the water use efficiency in canal irrigated areas. This programme is implemented with the funding pattern shared between the Central and State Governments on 50:40 basis with 10% as farmers contribution. The activities under the programme relate to efficient utilization of irrigation facilities through three major components viz, On-Farm Development (OFD), Rotational Water Supply (RWS) and Participatory Irrigation Management (PIM). One time functional grant at the rate of ₹1,000/- (State share of ₹450/-, Central share of ₹450/- and Farmers share of ₹100/-) per hectare is given to Water Users Associations for the maintenance of assets created under the programme.

During 2012–13, an area of 18165 hectares has been covered under this scheme with an expenditure of

₹4137.77 lakhs in four ongoing commands viz., Vaigai Project (Ramanathapuram, Sivagangai and Madurai districts), Kodaganar Reservoir Project (Dindigul district), Kalingarayan Anaicut Project (Erode district) and Varadhamanadhi Reservoir Project (Dindigul District) and in four new commands viz. Manimuktha Nadhi System (Villupuram and Cuddalore districts), Cheyyar Anaicut System (Thiruvannamalai district), Ellis Anaicut Project (Villupuram district) and Pelandurai Anaicut Project (Cuddalore district).

During 2013–14, it is proposed to continue the programme at an outlay of ₹6369.25 lakhs in seven ongoing commands viz. Vaigai Project (Madurai, Sivagangai, Ramanathapuram districts), Kalingarayan Anaicut Project (Erode district), Vardamanadhi Reservoir Project (Dindigul district), Manimuktha Nadhi System (Villupuram and Cuddalore districts), Cheyyar Anaicut System (Thiruvannamalai district), Ellis Anaicut Project (Villupuram district) and Pelandurai Anaicut Project (Cuddalore district).

4.2. World Bank Aided Tamil Nadu IAMWARM Project

The scheme of Irrigated Agriculture Modernisation and Water bodies Restoration and Management (IAMWARM) Project is being implemented with assistance from World Bank with an objective of increasing agriculture productivity & farm power in canal irrigated areas of Tamil Nadu. The project is implemented by the Public Works Department, Agricultural Engineering, Agriculture, Fisheries, Marketing, Animal Husbandry and various other departments. The project outlay of ₹135.79 crores is earmarked for Agricultural Engineering Department for taking up the following components in 51 sub-basins.

- a. Installation of Micro Irrigation Systems in sub-basin area with an aim to increase the irrigation efficiency to

save ground water thereby reducing the pumping hours of irrigation pump sets which leads to saving in electricity and to achieve more income per drop of water.

- b. Construction of farm ponds in the sub-basin area to conserve the rain water and utilise it back during the critical crop period by the farmers. Farm ponds are also used as fish pond to derive additional income by the farmers.
- c. Construction of Water Harvesting Structures to recharge the ground water in the sub-basin area.
- d. Supply of farm machinery to Water Users Associations, to increase the yield and income of the farmers through farm mechanisation.
- e. Conveyance of water to the ayacut area below the sluice outlet through buried pipe line to reduce the conveyance losses and improve the controlling system of irrigation water in a closed conduit by the use of hydrants. It saves more water than the conventional irrigation practices through earthen field channel.

So far, upto 2011-12, a sum of ₹6724.29 lakhs has been spent to cover 20,767 hectares under micro irrigation system and to construct 2024 farm ponds, 647 rain water harvesting works and supply of 800 machinery to Water Users Associations and installation of 12 improved water conveyance systems. During the year 2012-13, 9225 hectares have been covered under micro irrigation system and 114 farm ponds and 34 rain water harvesting structures have been constructed at a total expenditure of ₹3775.36 lakhs. During the year 2013-14, it is proposed to continue the scheme with a total outlay of ₹10,383 lakhs for taking up various components under the project.

5. Ground Water Recharge

Water is the basic ingredient for sustaining livelihood and development of all the sectors of economy spearheaded by agriculture. The rainwater stored in the form of groundwater is tapped for domestic, agriculture and industrial requirements. Urbanisation, industrialisation and increase in area under well irrigation have led to over exploitation of ground water, resulting in lowering of water levels in the wells far below economical pumping limits. The ground water extraction has resulted in intrusion of sea water into the inland fresh water aquifers. In the absence of perennial rivers, rainfall is the only source of water and that too inconsistent due to vagaries of monsoon. There is an urgent need for replenishing the ground water aquifer with each and every drop of rain water to ward-off impending severe water scarcity and for sustainable development. Therefore, it is absolutely necessary to construct artificial recharge structures to the greatest extent possible.

5.1. Rain Water Harvesting and Run off Management Programme

Rain Water Harvesting and Run off Management structures such as check dams, percolation ponds, farm ponds, new village tanks, Ooranies and recharge shafts are constructed in order to improve the moisture regime of the watershed for increased land use, in all districts except Chennai and the Nilgiris. Under this programme, the beneficiaries are required to contribute 10% of the cost of works executed in community lands in cash (it is 5% in case of SC/ST), which will be deposited in the name of the Village Development Association / Watershed Association and the accrued interest will be utilised for the maintenance of assets created in community lands. Works in patta lands are taken up with 90% assistance and the remaining 10% is collected as beneficiary share (it is 5% in case of SC/ST) in

the form of cash / labour / material. During 2012-13, 100 rain water harvesting structures have been constructed at a cost of ₹91.45 lakhs.

5.2. Scheme for Artificial Recharge of Ground Water

Artificial ground water recharge structures such as check dams, village tanks, Ooranies and percolation ponds with recharge shaft are constructed to augment the ground water aquifer for raising the ground water table to economical pumping levels. These artificial recharge structures intercept and store the rain water which further stimulates recharge of groundwater aquifer by infiltration, seepage and percolation. The programme is taken up with 100% assistance from the Government. During 2012-13, 555 Artificial Recharge Structures have been constructed at a cost of ₹2419.62 lakhs. It is proposed to continue the programme during 2013-14 with an outlay of ₹5293 lakhs for constructing 1177 artificial recharge structures.

5.3. Construction of Farm Ponds under the Integrated Development of Pulses Villages in Rainfed Areas

To reduce the adverse impact of the moisture stress and for bringing sustainability in pulses production in dryland agriculture, harvesting, conservation and management of the rain water is very important. Farm ponds are the suitable rainwater harvesting and storage structures at farm level. Farm pond facilitates life saving supplemental irrigation at critical stages of crop growth at times of water scarcity. During 2012-13, the programme is implemented in eight districts viz. Krishnagiri, Dharmapuri, Vellore, Tiruvannamalai, Salem, Tiruppur, Dindigul and Tirunelveli 210 new farm ponds have been constructed at an expenditure of ₹166.22 lakhs for giving supplemental irrigation to pulse crops so as to enhance the production and

productivity. During 2013-14, it is programmed to construct 250 farm ponds in 10 major pulses growing districts at a total financial outlay of ₹200 lakhs.

6. Soil & Water Conservation

In Tamil Nadu, the land available for agriculture is subjected to soil erosion of varying degrees which results in degradation of cultivable land. The state has harnessed almost the entire available irrigation potential for agriculture. The land and water resources of the State are to be conserved and developed intensively to protect and improve the soil health. Hence, soil and water conservation programmes are taken up in a larger scale to prevent soil erosion, to prevent land degradation and to improve soil moisture regime for sustainable increase in agricultural production.

6.1. Soil & Water Conservation in River Valley Project Catchments

With an objective to prevent soil loss to reduce siltation of multipurpose reservoirs, prevention of land degradation, improvement of land capability, improvement of soil moisture regime and promotion of land use to match land capability, the Centrally Sponsored Scheme of River Valley Project is implemented under the Macro Management of Agriculture with the financial assistance from the Centre and State Government on 90:10 basis. Under this programme, soil and water conservation measures are taken up in the inter-state river valley catchments of Tamil Nadu. Soil and water conservation measures such as contour bunding, horticultural plantations, agro forestry, drainage line treatments, farm ponds, silt detention structures, water harvesting structures are taken up in the catchment areas approved by the Soil and Land Use Survey of India (SLUSI) and Government of India. The soil and

water conservation measures are taken up with 100% assistance and however, work to individual farmer such as farm ponds etc., are executed with 25% farmer's contribution. During 2012-13, the programme has been implemented to cover an area of 10551 hectares and 1049 structures have been constructed in South Pennaiyar and Mettur river valley catchments in Dharmapuri and Krishnagiri districts with a total expenditure of ₹1154.06 lakhs. During 2013-14, it is proposed to continue the programme under NADP in Dharmapuri, Krishnagiri and Erode districts with an outlay of ₹1200 lakhs.

6.2. Soil & Water Conservation in Tribal Areas under Integrated Tribal Development Programme

Adopting suitable soil and water conservation measures to develop tribal agricultural lands is the objective of this programme. The programme is implemented in the tribal areas of Jawadhu hills (Vellore and Tiruvannamalai districts), Kalrayan hills (Salem and Villupuram districts), Shervaroy hills and Arunuthu hills (Salem District), Sitheri hills (Dharmapuri district), Kolli hills (Namakkal district) and Pachamalai (Salem and Tiruchirapalli districts). Soil and water conservation measures such as land shaping, pipe laying, construction of contour rubble bunds, contour stone walls and check dams are taken up by the department in the lands of the tribal farmers with 100% assistance from the Government. During 2012 – 13, soil and water conservation programmes have been completed in 45 hectares and 3 structures have been constructed at an expenditure of ₹17.68 lakhs. During 2013-14, it is proposed to continue this programme at an outlay of ₹550 lakhs.

6.3. Soil & Water Conservation under Hill Area Development Programme

With the aim of restoring and maintaining the ecology of the Nilgiris, Hill Area Development Programme is being implemented in the Nilgiris District. Under this scheme, soil and water conservation measures such as stream training works, drainage line treatment works, community irrigation wells, aligning and providing lining works to irrigation channel, channel alignment and widening, drying yards, providing irrigation facilities – check dams with pipelines and landslide preventive measures are being taken up in the Nilgiris District. The beneficiary contribution is 10% of the cost of works in the patta lands and it is 5% in case of SC/ST beneficiaries. The community works and the landslide treatment measures are executed with 100% assistance. During 2012-13, soil and water conservation works have been completed at a cost of ₹633.23 lakhs. During 2013-14, it is proposed to continue the programme in the Nilgiris at a cost of ₹656 lakhs.

6.4. Soil & Water Conservation under Western Ghats Development Programme

To ensure eco-restoration, eco-development and eco-protection in Western Ghats areas, soil & water conservation measures under Western Ghats Development Programme are being implemented by the Agricultural Engineering Department in Coimbatore, Tiruppur and Kanyakumari districts. Soil and water conservation measures such as contour rubble bunds, gabion structures, check dams, drainage line treatment works, water harvesting structures, farm ponds, percolation ponds, village ponds, land shaping are taken up under this programme. The beneficiary contribution is 10% of the cost of works in patta

lands and it is 5% in case of SC/ST beneficiaries. For community works, 5% of the cost of works is collected as beneficiary contribution. During 2012-13, soil & water conservation measures have been completed at an expenditure of ₹414.10 lakhs in Coimbatore, Tiruppur, and Kanyakumari districts.

6.5. Dam Rehabilitation and Improvement Project

The World Bank aided Dam Rehabilitation and Improvement project (DRIP) has been approved for implementation in the 46 Water Resources Dams and 38 Tamil Nadu Electricity Board Dams at a cost of ₹74549 lakhs from the year 2012-13 onwards. This includes catchment area treatment of two reservoirs of Krishnagiri and Kundah by the Agricultural Engineering Department in a period of three years from 2013-14 with a total outlay of ₹1541 lakhs. The main objective of the programme is to prevent land degradation by adoption of suitable soil and water conservation measures in the catchment areas and to reduce siltation of multipurpose reservoirs. The conservation measures proposed to be taken up in the catchment areas of Krishnagiri reservoir are check dams, diversion drains, sunken ponds, farm ponds, percolation ponds, retaining wall and ploughing the hard pan area with disc plough. The conservation measures proposed in the catchment areas of Kundah reservoir are drainage line treatment works, terrace support wall, facial revetment, river widening and channel alignment, silt detention structures and landslide treatment works. During 2013-14, it is programmed to implement the programme in Krishnagiri and Kundah reservoir catchments at an outlay of ₹332.12 lakhs.

7. Special package for samba cultivation in Delta districts

In view of the non-availability of enough water in the Mettur Dam, the Kuruvai cultivation in Delta districts could not be taken up fully. In order to take up the preparatory works for samba cultivation, 30 higher hp tractors to be used as the power source for operating the laser land leveller, 30 tractor drawn seed cum fertiliser drill for direct sowing and 5 paddy transplanters for increasing the area under transplantation have been purchased during 2012-13 at a total cost of ₹302.23 lakhs for hiring out to delta districts farmers. Besides, to help the delta district farmers to take up samba preparatory cultivation works, a sum of ₹40.56 lakhs has been given as 50% subsidy on hire charges for hiring of agricultural machinery.