

Long-term Strategies and Programmes for Mechanization of Agriculture in Agro Climatic Zone-VII : Eastern Plateau and Hills region

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1. NAME OF AGRO CLIMATIC ZONE : Eastern Plateau and Hills region
2. STATES UNDER THIS ZONE : Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Orissa and West Bengal



3. SUB-AGRO CLIMATIC ZONES WITH THEIR CHARACTERIZATION

This is the largest agro-climatic zone covering about 400 thousand square kilometres of geographical area. It spans across parts of Maharashtra, Madhya Pradesh, Orissa and West Bengal and is divided into five sub-zones. The population is largely rural with a concentration of tribals in the Chhattisgarh area in Orissa. The average annual rainfall is about 1,350 mm.

Shifting cultivation has been the traditional pattern of farming and the mode of land use among tribals in this zone. Some controls on this practice have been effective in Jharkhand and Madhya Pradesh.

Agricultural productivity is quite low. Over a quarter of the region is covered by forests. In parts of Madhya Pradesh and Maharashtra falling under this zone, nearly half of the geographical area is covered by forests. A gradual decline is noticed in the area covered with forests.

3.1 Wainganga

This sub-zone spans eleven districts cutting across the States of Maharashtra, Madhya Pradesh and Orissa. It includes the eastern most districts of Maharashtra, viz. Bhandara, Chandrapur and Gadchiroli; the southern districts of Madhya Pradesh, viz. Balaghat, Durg, Rajnandgaon, Raipur and Bilaspur and three districts from Orissa, Balangir, Sambalpur and Dhenkanal.

The region receives about 1,270 mm of annual rainfall and the climate is dry sub-humid. The soils vary within the sub-region. In the districts of Maharashtra they are mostly medium to deep black and yellow. In Madhya Pradesh they are medium to deep sandy loam to clayey soils with neutral to slightly acidic soil reaction, and in Orissa soils are medium to deep black, red and yellow.

Agricultural productivity is quite low. In Maharashtra, forest cover is about 48%. Only 30% of the area is cultivated of which only 28% is irrigated. The area has high but under-utilized agricultural potential. Forest cover drops to around 14% in the Madhya Pradesh districts of the sub-zone. Nearly 47% of the area is cultivated and 27% of this is irrigated. Forest cover increases again to about 37% in the inlands of Orissa.

3.2 Orissa Northern Hills and Plateau and MP Hills

This sub-zone covers Shahdol, Surguja and Raigarh in Madhya Pradesh and Sundargarh, Kendujhar and Mayurbhanj in Orissa. It receives about 1,436 mm of rainfall annually. Climate is moist to dry sub-humid. The soil is red and yellow and red sandy.

About a third of the area is under forests and a little over a third is cultivated. Irrigation development is very poor. In the plateau of Orissa, rainfall is heavy and intensive. However, nearly 60% of the rain water is lost as runoff causing soil erosion and land degradation.

3.3 Chhota Nagpur North and Eastern Hills and Plateau

This sub-zone falls in the plateau region of Jharkhand covering the districts of Godda, Sahibganj, Dumka, Deogarh, Dhanbad, Giridih, Hazaribag and Palamu. Unlike the plains of Jharkhand, these southern regions are less developed. Population density and agricultural productivity is much lower in these regions. The area receives higher rainfall of around 1,320 mm annually compared to the less than 1,200 mm rains in northern Bihar. However, while irrigation is well developed in the northern plains, only 11% of the cultivated area in the hills and plateau is irrigated.

The climate is moist sub-humid to sub-humid and the soil is red sandy, red and yellow.

3.4 Chhota Nagpur South and West Bengal Hills and Plateau

Located at the southern tip of Bihar, this sub-zone covers Palamu, Gurala, Lohardaga, Ranchi and Singhbhum. Thirty per cent of the area is classified as forests and only about a quarter of the area is cultivated. It receives about 1,400 mm of rainfall annually but irrigation development is very poor as only eight per cent of the cultivated area is irrigated.

The climate is moist sub-humid to sub-humid and the soil is red loamy and red and yellow.

3.5 Chhattisgarh and South Western Orissa Hills

About half of this sub-zone is classified as under forest cover. The districts included in this region are Bastar in Madhya Pradesh and Koraput, Kalahandi and Phulabani in Orissa. About 62% of the area of Bastar is under forests and only about 22% is cultivated, of this only about two per cent is irrigated. In Koraput, Kalahandi and Phulabani, over 40% of the area is classified as forests and again about a third of the area is cultivated. Irrigation development is better than in Bastar but is still quite low at about 14%.

This being the largest agro climatic zone, the details relating to mechanization strategies are being discussed separately for each constituent State.

(A) Chhattisgarh State

1. BRIEF SCENARIO

The level of irrigation in Chhattisgarh is fairly low.

Irrigated area is just about one fifth of the total cultivated area in the State. Chhattisgarh has about 19% of the undivided of Madhya Pradesh. The net irrigated area by net sown area is only 22% and gross irrigated area by gross cropped area is just 22%. The main source of irrigation is canals, which provide 75% of all irrigation, 8% of the irrigation is done by tubewells, 6% by tanks and 4–5% by wells. Raipur and Bilaspur have 80% irrigation through tubewells and 35% irrigation through tanks. Surguja has 40% irrigation from miscellaneous sources. The Scheduled Tribes are concentrated in the southern, the northern and the north-eastern districts. The highest concentration is in the erstwhile Bastir district. The new district of Dancwear has 79% tribal followed by Bastar (67%), Jashpur (65%), Surguja (57%) and Kanker (56%). Chhattisgarh State has population density of 130 persons/sq. km. The main *rabi* crops of Chhattisgarh are *gram*, *jowar*, *urad*, *moong* and *moth*. Chhattisgarh produces nearly half of all food grains of undivided Madhya Pradesh during the *kharif* season. The agricultural production in the State is 65.53 lakhs tonnes. The land under cultivation in Chhattisgarh is around 5,800–6,000 hectares which is around 23–24% of the total area cultivated in undivided Madhya Pradesh. The foodgrain yield and fertilizer consumption vary in between 767–1,199 kg/ha and 9–72 kg/ha respectively.

2. MAJOR OBJECTIVES FOR MECHANIZATION

Eight districts of Chhattisgarh State are divided into 95 blocks. The State currently has an area of 0.82 million ha which is under double cropping. By 2010, 100% of the total net cropped area would be made suitable for double cropping. The State currently has an irrigated potential of approximately 1.34 million hectares and would increase this irrigated potential to 4.02 million hectares by 2010, by increasing the number of water pumps across the State. The literacy rate in the State is 65.19%. The State currently has 54,816 hamlets, of which approximately 85% have access to drinking water. In the State, metalled roads cover approximately 40% of the 19,720 villages in the State. At present 38.91% of the State population is below the poverty line. The soil type varies from sandy-clay-loam to clay. The percentage of marginal farmers is highest (45.47%). The medium and large land holding constitutes 11.2% and 10.22% respectively of total holdings. The marginal farmers are not in a position to purchase improved implements due to their poor economical conditions. Bullock drawn implements such as country plough, tiffan, blade harrow, rack, and puddler are mostly used. The progressive

farmers use tractor drawn implements. The custom hiring of tractor with different implements is commonly adopted practices in Chhattisgarh State. The main crop rice and second is linseed, Chickling vetch, Kodo-Kutki and minor millets. Therefore, for paddy the self-propelled rice planter, manual rice transplanter, cono weeder and self-propelled small harvester are required. The cropping intensity of these districts is between 107–143%. The custom hiring charge of tractor with cultivator is Rs 150/h. The hiring charges of thresher and combine harvester are Rs 30/q and Rs 1,200/ha respectively. The objectives of agricultural mechanization in the State are as follows:

- (i) To promote package of improved implements for rice cultivation.
- (ii) To introduce bullock drawn improved implements package for cultivation of pulses and oil seeds.
- (iii) To introduce horticultural equipment.
- (iv) To mechanize harvesting and thresher operations of different crops.
- (v) To promote small hand tools in the tribal region of the State.
- (vi) To promote agricultural processing and value addition of raw produce.

3. IDENTIFICATION OF THE MECHANIZATION PACKAGE

There is need to mechanize tillage operation in all crops (except paddy) through introducing animal improved blade and animal disc harrow. The use of animal drawn puddler, manual cono weeder manual rice transplanter, manual pre-germinated rice seeder, self-propelled rice transplanter and multicrop thresher have tremendous scope for mechanizing different agricultural operations for paddy cultivation in State. The use of animal drawn seed cum fertilizer drill and animal drawn inclined plate planter, have good scope for promotion in the pulses and oilseeds-growing region of Chhattisgarh. There is no mechanization in fruits and vegetable cultivation. Self-propelled power weeder, and manually operated knapsack sprayer and manual fruit harvester should be introduced. For sowing oilseeds and pulses, the common practice by farmers is dropping of seeds behind the country plough, which results into more human drudgery. Sorghum cultivation is also not mechanized in sowing, harvesting and threshing operations in the Chhattisgarh State. The harvesting of sorghum is done manually. The self-propelled fodder harvester should be introduced in the State. The medium and large farmers should use rotavator, tractor mounted inclined plate planter and tractor drawn vertical conveyor reaper, which are cost effective. For groundnut

cultivation, the suitable equipment for State are animal drawn groundnut digger, tractor mounted groundnut digger and TNAU power operated groundnut thresher. For sunflower cultivation, Phule sunflower thrasher and PAU sunflower thresher should be introduced to mechanize threshing operation.

4. BENEFITS OF THE MECHANIZATION PACKAGE FOR ALL CATEGORY OF FARMERS

Through front line demonstration of package of improved implements for different cropping pattern close coordination with Directorate of agriculture and State Agricultural Universities.

Under Central/State subsidy programme for tribals of Chhattisgarh, SC/ST and marginal/small land holdings, the benefits of mechanization package should be ensured and feedback on their uses should be obtained. For using improved equipment package, trainings on operation, adjustment and repair—maintenance should be conducted at block levels. Large farmers can play a vital role in promoting custom hiring of high capacity improved equipment package, viz. rotavator, seed cum fertilizer drill, tractor drawn planter, Self-propelled rice transplanter, tractor drawn/self-propelled vertical conveying reaper, power sprayer and multi-crop thresher.

5. BRIEF SCENARIO OF FARM POWER AVAILABILITY

The availability of total farm power is 0.68 kW/ha in Kanker district. The minimum available total farm power is in Bastar district (0.30 kW/ha). The total farm power availability in Raipur, Durg, Rajnandgaon, Bastar, Bilaspur, Surguja, Raigarh, and Kanker districts is 0.51, 0.40, 0.36, 0.30, 0.42, 0.39, 0.45 and 0.68 kW/ha respectively. The intensity of tractors in Raipur and Bilaspur districts is 226.13 ha/tractor and 332.73 ha/tractor respectively. In Raipur, Bastar and Bilaspur districts. The intensity of irrigation pumps is 53.6, 148.8 and 104.4 ha/pump. The future requirement of total farm power availability should be thrice during next 15–20 years. The bullock drawn implements requirements should be five folds to bridge the mechanization gaps in the State. The growth of tractor population and irrigation pump should be at 5% per annum during 15–20 years.

Suggestions for diversification of agriculture, if needed, with full justification.

In addition to introducing fine varieties of paddy, there is ample scope to boost the economy of farmers by marginal shifting to fruits, floriculture and other cash crops in Chhattisgarh. The diversified agriculture can

bring this State in the category of leading exporting States. The dairying and poultry business combined with cash crop cultivation can usher the condition of farmers. The modern irrigation equipment and credit from banking and use of improved equipment are the requirement for success of diversified agriculture in the State. There is a risk to paddy cultivation due to attack of insects and hazards from rains after harvesting spoiling quality of paddy. Therefore, the farmers are suggested different cropping pattern viz mango banana, guava and orange under erratic condition of rainfall To reduce the dependence on paddy, soybean, groundnut, sunflower, are the other important crops which can be considered under diversified agricultural to boost the economy in the State.

6. PRESENT INFRASTRUCTURE AND PROGRAMMES OF AGRICULTURAL MECHANIZATION

Agricultural Engineering Division located at Indira Gandhi Krishi Vishwavidyalaya, Raipur has objectives given below:

- (i) To impart skill oriented training on operation and maintenance of agricultural tools, implements and machinery in most scientific manner using latest techniques and methodology for improved farming.
- (ii) To offer special refresher course in farm machinery for in-service personnel such as extension officials from State Government Departments, scientists and teachers from State Agricultural Universities.
- (iii) To organize training for Subject Mater Specialists of State Departments of Agriculture for updating their knowledge on development of new and improved agricultural equipment and technology.
- (iv) Training of trainers from KVKs on advances in agricultural engineering research.

Agricultural Engineering Division located at Indira Gandhi Krishi Vishwavidyalaya, Raipur provides training to the rural youth on manufacturing aspects of improved farm equipments. This division also imparts training to manufacturers of small-scale industries engaged in the production of farm equipment.

7. PRESENT SCENARIO FOR EDUCATION AND TRAINING OF ENGINEERS

Indira Gandhi Krishi Vishwa Vidhyalaya, Raipur: There is provision for master degree in agricultural engineering. There is need of bachelor degree course in agricultural engineering.

The State Govt. should establish two polytechnic colleges in agricultural engineering to strengthen agri clinic in the interior of the State. The Central Govt. should also establish a new technical teachers training institute in Chhattisgarh region for ensuring quality education of rural development technologies. Each district should have Krishi Vigyan Kendra with specialist in agricultural engineering.

8. R&D AND TESTING FACILITIES

Indira Gandhi Kirshi Vishwa Vidhyalaya, Raipur: There is department of agril. Engineering for carrying out the R&D activities in agricultural engineering.

9. PRESENT SCENARIO OF AGRICULTURAL MACHINERY MANUFACTURE AND SERVICE FACILITIES

In Chhattisgarh State there are 115 agricultural implement manufacturers. In the State there are also supplier of improved implements procured from Punjab State. The manufacturers should be encouraged to participate in training programme organized by prototype production centre located at Central Institute of Agricultural Engineering.

10. EXISTING FACILITIES FOR GETTING NEW DESIGNS OF IMPROVED MACHINERY

On the basis of the mechanization gap for different agricultural operation and power sources need of the equipment is identified. Keeping in view the human power, draught animal power and existing power capacity of the tractor farm equipment is designed and tested in the laboratory then test trials are conducted at research farm to finalize equipment for field testing at farmers field. The manufacturers are provided engineering drawing/computer aided design and are provided training in the standard production technique for saving in cost of production and wastage of raw material. Manufacturers are liaised for monitoring quality of improved farm equipment.

11. PROJECTIONS OF REQUIREMENT OF DIFFERENT TYPES OF MACHINERY

It is given in Table 1.

12. BRIEF SCENARIO OF TECHNOLOGIES USED BY THE FARMERS TO REDUCE LOSSES

There is no equipment/technologies used by the farmers to reduce losses, specially of perishables and

semi-perishables. on-farm/villages level processing of agricultural produce can be performed with simple low cost equipments for different crops. The adoption will help in enhancing the quality of produce. There is need to promote small solar dryers, zero cool chamber, pedal operated cleaner cum grader, small oil expeller, low capacity cold storage mini dal mill, manual groundnut decorticator. There is need to impart training on processing equipment to upgrade there quality of agricultural produce during post harvest operations.

13. TECHNOLOGY PARKS

Technology park are not available in the State. The display centre is available at Indira Gandhi Krishi Vishwa Vidyalaya, Raipur in the Department of Agricultural Engineering. There should be three-technology park at Raipur, Bilaspur and Durg.

14. PRESENT SCENARIO OF CROP RESIDUE MANAGEMENT

There is no existing method for crop residue management in the Jharkhand State. The use of animal drawn improved *bakhar* blade, animal drawn MB plough

Table 1. Projection of requirements of farm implements and machinery in Chhattisgarh State

Name of important machinery	Number of machinery			
	2000	2005	2010	2020
Animal drawn improved bakhar blade	20	200	1,000	5,000
Animal drawn Inclined planter	3	50	100	350
Animal drawn seed-cum-fertilizer	20	700	2500	7,000
Manual mustard drill	–	50	200	800
Animal drawn potato planter	–	50	200	700
Animal drawn ridger	10	80	250	500
Animal drawn puddler	20	150	300	500
Manually operated paddy thresher	100	500	1,000	2,000
Manual wheel hoe	25	100	500	2,000
Animal drawn Groundnut harvester	10	100	300	800
Manual groundnut decorticator	10	100	500	1,000
Cono weeder	10	100	200	1,000
Self propelled vertical conveyor reaper	10	100	500	1,000
Improved sickle	200	1,000	2,000	10,000
Tubular maize sheller	100	1,000	5,000	10,000
Manual rotary dibbler	–	100	1,000	4,000
Manual garlic planter	–	50	300	1,000
Manual rice transplanter	10	100	400	1,000
Manual rice seeder	–	50	200	1,000

and animal drawn disc harrow should be promoted for incorporation of straw left due to harvesting of previous crops. The surplus biomass should be utilized for preparation of briquette.

15. WATER MANAGEMENT

For efficient water management there is urgent need of promoting sprinkler and drip irrigation systems. The subsidy on purchase of sprinkler sets and drip irrigation sets have encouraged few progressive farmers in soybean and wheat and for horticulture crops. The use of sprinklers and drip sets reduce drudgery and saved water although initial capital investment is higher. The sprinkler irrigation has immense for adoption in water scarcity zone of State.

16. SCOPE OF COVERED AND PROTECTED CULTIVATION AND STRATEGY FOR FUTURE

In initial stage, the covered cultivation and protected cultivation should be demonstrated to farmers especially in vegetable growing region. Due to faster growth of crop and better quality products such practices should be promoted by providing subsidy and imparting training to progressive farmers. The plastic mulching demonstrations should be conducted at research farm of IGKV, Raipur. These can be introduced at few places with the active Govt. support and subsidy during the current plan period for selected crops.

17. ESTABLISHMENT OF LABORATORY FOR QUALITY TESTING

For export, the quality of agricultural produce should be clean, graded and free from moisture especially rice, wheat, oilseeds and pulses. There is also ample scope for export of mango, onion and horticultural crops products. The preservation of fruits and floriculture products for export should follow standard norms of packaging so that products are acceptable in international market. The thrust for export zone has already been given by State Govt. with incentives and tax rebates to progressive farmers.

18. STORAGE AND MARKETING OF PERISHABLE AND SEMI-PERISHABLE PRODUCE

Existing facilities are insufficient for preservation of perishable and semi perishable products affecting their shelf life. Farmers are not able to get remunerative prices of bulk produce due to preservation and handling problems. There are limited cold storage and cool chains

owned by few progressive farmers which are charging higher storage charges. These units are not capable of handling and storing such produce. Then marketing of perishable and semi perishable products is greatly influenced by middlemen in mandi. In the State full production of vegetable is directly sold to consumer without any preservation except storage some quantity of potato and onion in Raipur, Bilaspur and Durg region.

19. TECHNOLOGY PACKAGE TO MEET REQUIREMENT OF PRODUCTION AND PROCESSING OF AGRICULTURAL EXPORT ZONES

For proper processing, storage and handling for perishable and perishable products infrastructure need to be promoted. The list of few equipment includes power operated cleaner cum grader, solar cabinet dryer, multi-rack dryers, vegetable dryer, many dal mill, equipment osmotic dehydration-cum-air drying of vegetable, like cauliflower, button mushroom and green pea kernel and power operated fruit grader. In each export zone there should be a laboratory for certifying the exportable quality of produce such as rice, wheat fruits and other floriculture products. The farmers should be imparted training for improving quality of produce using standard techniques of handling processing storage and packaging

20. ROLE OF IT AND KIOSKS

For providing information to the farmers information centres have been established by Department of Agricultural. These centres are well computerized which are accountable to communicate about soil crop variety, fertilizer chemicals and irrigation requirement. Presently the farm equipment availability, source of supply, costs have not been included in the schedule of these centres. The farmers in the State need information regarding improved equipment, which can be communicated through strengthening role of IT and kiosks at district level. TV and Radio are also imparting information of improved equipment for different crops.

Agricultural Technology information centres have been established at IGKV, Raipur for providing information to the farmers about the availability of equipment and technologies for different crops, sources of supply, costs, etc. Information technology is the need of the hour for efficient utilization of inputs and selection of power sources/Agricultural equipments matching with the land holding to different categories farmers.

21. LAND REFORMS

In Chhattisgarh, land reforms have been performed

after receiving first hand information about categories of land holdings, irrigated land and dryland in the State. The computerization of agricultural land records helped policy makers in the State. For promotion of mechanization land reforms should be continued to reduce further fragmentation of lands. There is more difficulties in mechanized agriculture if lands fragmentation is continue in the State. Therefore there is need to create awareness in the villages for reducing fragmentation of land to ensure use of improved equipment for achieving higher lands and labour productivity. In too small field it is difficult to move machinery for different agricultural operation and field efficiency is too low.

22. AGRI-CLINICS/CUSTOM SERVICE CENTRES

Agri-clinic and custom service centre concept is the need to transfer improved cultivation technologies/equipment in the State. The modern agriculture requires judicious use of input like seed, organic/chemical fertilizers, and chemicals. In Chhattisgarh custom care centre can play a vital role to boost agricultural production and economic return can be increased to the farmers. Through custom services/taking contract jobs for seedbed preparation, sowing, planting, weeding, plant protection, harvesting threshing etc there is immense potential to provide employment for agricultural graduates/Agricultural Engineers.

23. SETTING UP OF STATE LEVEL AGRICULTURAL MECHANIZATION BOARD

Dissemination of technology requires strong network of research engineers, extension engineers, manufacturers and progressive farmers. The review of on-going programmes related to agricultural mechanization is continuing at Department of Agril. Engineering, IGKV, Raipur, which is regular activity.

For more active participation of State agencies like Directorate of Agriculture, Chhattisgarh. Chhattisgarh State Ware Housing Corporation and Chhattisgarh State *Urja Vikas Nigam*, there is need of setting up of a State level agricultural mechanization Board headed by the minister of agriculture. All blocks in each districts should have a sales and service centre of improve farm equipment. The extension engineers should be accountable for front line demonstrations of improved farm equipment; for different agricultural operations. These equipment should also be promoted on custom hiring through involving large farmers/entrepreneurs.

24. AGRICULTURAL MECHANIZATION POLICIES AND ISSUES

There is need to mechanize tillage operation in all crops (except paddy) through introducing animal improved blade and animal disc harrow. The use of animal drawn puddler, manual cono weeder manual rice transplanter, manual pre-germinated rice seeder, self-propelled rice transplanter and multicrop thresher have tremendous scope for mechanizing different agricultural operations for paddy cultivation in State. The use of animal drawn seed cum fertilizer drill and animal drawn inclined plate planter, have good scope for promotion in the pulses and oilseeds-growing region of Chhattisgarh.

For increasing yields and cropping intensity agricultural mechanization policy should be formulated

- to increase income of agricultural workers to reduce inequality reduction.
- to mechanize the farms of all categories.
- to reduce health hazards and increase safety in operation of farm machinery.
- to conserve and properly utilize natural resources such as land and water.
- to improve utilization efficiency of inputs such as seeds, chemicals, fertilizers and energy.
- to reduce cost of production.

The targets to achieve the above objectives are:

- Increase of power input to 1.5 kW/ha by the year 2020.
- To custom hire high capacity farm machines for timeliness of operation where turn around time is low.
- To improve management of farm machinery.
- To mechanize hill agriculture.
- To mechanize paddy, groundnut, fruits and vegetable crops and covered cultivation.
- To improve quality of manufacture of farm machinery.
- To strengthen R&D—manufacturer linkages.

25. HIGHER ALLOCATION OF FUNDS FOR AGRICULTURAL MACHINERY

Under Central subsidy/subsidy, Chhattisgarh State Government are covering few farmers and still majority of tribal and small farmers are unable to purchase improved equipment due to their higher cost. Providing higher allocations for Agril. Machinery will definitely make bright chances for rapid mechanization. In the State credit up to Rs 1 lakh; is required for purchase of animal drawn matching improved equipment for the average farmer having land holding of 2–4 ha. For irrigated land,

farmers should be provided minimum Rs 3 lakh credit for mechanized farming.

26. SEPARATE NORMS FOR FIELD LINE DEMONSTRATIONS

For front line demonstrations of improved equipment the funds requirements are quite high, separate norms are required fixed for FLD of different types of machinery. The expenses incurred on transport, operator, labour, seeds, fertilizer and chemicals are quite high which requires Rs 2,000/ha for successful demonstration. The crop demonstrations do not require costly inputs.

27. COLLECTION OF RELIABLE DATA

The arrangement for collection of reliable data, monitoring of agricultural mechanization is continue at FIM Project centres located at JNKVV, Jabalpur. In the State, the information on production and sale of different agricultural machinery have been collected in the farm implements manufacturers survey at JNKVV, Jabalpur. The computerized information is yet to be prepared for web site. There is need of strengthening continuous process for collecting regular information on production and sale of agricultural machinery in the State. A monthly-published document is required which can focus production and sale of improve equipment in the State.

28. SWOT ANALYSIS OF MECHANIZATION PROGRAMME

Strengths

- The Chhattisgarh State is self sufficient in food grains and electricity. In the State, 93% villages are electrified. The safe drinking water is available to 85% population.
- The State has good potential for horticultural crops (1.23 lakh ha)
- The principal crops of *rabi* season are gram, *jowar*, *urad*, *moong* and moth. In *kharif* rice is the main crop.
- The State has mostly double cropping system
- In the State, 40% roads are metalled type.
- The percentage of marginal farmers is highest (45.47%).
- The custom hiring of tractor drawn equipment is common in the State.
- The linseed is main pulse crop in the State.
- The cropping intensity varies 107–143%.
- The equipment like cultivator, thresher and combine are custom hired.
- The State has agricultural university (IGKVV) at

Raipur and KVK's of university and ICAR equally share to create awareness for use of improved equipments and organize farmer's fair, Kisan Ghosthi and training programs.

- In Chhattisgarh State, there are 115 agricultural implement manufacturers.
- The main irrigation source is canal in Chhattisgarh part of this zone.
- The Agricultural University namely Indira Gandhi Krishi Vishwavidyalaya, Raipur is playing an effective role in the spread of mechanization.

Weaknesses

- The availability of total farm power is very low (0.30–0.68 kW/ha).
- In the Chhattisgarh State, the fertilizer consumption rate is very low (9–72 kg/ha).
- Irrigated area is just about one fifth of the total cultivated area in Chhattisgarh.
- There is no time specific mechanization strategy of State government to accelerate the sustainable agriculture development.
- There is no mechanization in fruits and vegetable cultivation.
- For sowing oilseeds and pulses, the common practice by farmers is dropping of seeds behind the country plough, which results into more human drudgery.
- The harvesting of sorghum is done manually. The medium and large farmers should use rotavator, tractor mounted inclined plate planter and tractor drawn vertical conveyor reaper, which are cost effective.
- For groundnut cultivation, the suitable equipment for State are animal drawn groundnut digger, tractor mounted groundnut digger and TNAU power operated groundnut thresher.
- For sunflower cultivation, Phule sunflower thrasher and PAU sunflower thresher should be introduced to mechanize threshing operation
- The State has large mechanization gaps in different agriculture operations. The manufacturers are producing sub-standard implements without use of standard production technique.
- The network after sales service of implements and machinery is not effective. The farm equipment demonstration and training program need task force, e.g. Agri-clinic and KVK in each district. There is no package of improved equipment for rice cultivation for different power sources.

- The efficient improved equipments like puddlers, rotavator, disc harrow, seed drill, wheel hoe, planter, reaper, digger, tubular hand maize sheller, manual rice transplanter and multicrop thresher have not been widely accepted. The agricultural operations for all crops are performed by animate sources due to low purchasing capacity of farmers.
- There is no equipment/technologies used by the farmers to reduce losses, specially of perishables and semi-perishables. on-farm/villages level processing of agricultural produce can be performed with simple low cost equipments for different crops.
- Technology park are not available in the State.
- There is no existing policy for crop residue management in the State.
- The larger capacity costly equipment cannot be afforded by majority of farmers.
- Under Central subsidy/subsidy, Chhattisgarh State Govt. are covering few farmers and still majority of tribal and small farmers are unable to purchase improved equipment due to their higher cost
- The use of rotavator, self-propelled reaper, inclined plate planter, wheel hoe, puddler, cultivator and multicrop threshers have potential to bridge the mechanization gaps.
- The percentage of marginal farmers (45.47%) can reduce farm mechanization gaps if regular supply of improved farm equipments is ensured through strong network.
- The fertile land (Sandy clay loam to clay) is capable to sustain agriculture development through precise use of inputs.
- The State has scope to mechanize fruits and vegetable cultivation to eliminate human drudgery.
- The value addition of raw farm produce can provide better revenue to entrepreneurs with generation of employment opportunities.
- The compost, vermi-culture and IPM have opportunities for sustainable agriculture in the State.
- There is ample scope to mechanize bullock owned and power tiller owned farms with the use of commercialized matching equipments.

Opportunities

- In addition to introducing fine varieties of paddy, there is ample scope to boost the economy of farmers by marginal shifting to fruits, floriculture and other cash crops in Chhattisgarh. The diversified agriculture can bring this State in the category of leading exporting States. The dairying and poultry business combined with cash crop cultivation can usher the condition of farmers.
- The use of animal drawn puddler, manual cono weeder manual rice transplanter, manual pre-germinated rice seeder, self-propelled rice transplanter and multicrop thresher have tremendous scope for mechanizing different agricultural operations for paddy cultivation in the State.
- The use of animal drawn seed cum fertilizer drill and animal drawn inclined plate planter, have good scope for promotion in the pulses and oilseeds-growing region of Chhattisgarh.
- The medium and large farmers should use rotavator, tractor mounted inclined plate planter and tractor drawn vertical conveyor reaper, which are cost effective.
- For groundnut cultivation, the suitable equipment for the State are animal drawn groundnut digger, tractor mounted groundnut digger and TNAU power operated groundnut thresher.
- The complete equipment package to Panchayats may be provided which can hire them users on charge basis.
- The subsidies of improved equipment (30–50%) have opportunities to fill the gaps of mechanization.
- There is need to promote small solar dryers, zero cool chamber, pedal operated cleaner cum grader, small oil expeller, low capacity cold storage mini dhal mill, manual groundnut decorticator.
- There is need to impart training on processing equipment to upgrade there quality of agricultural produce during post harvest operations.
- In Chhattisgarh custom care centre can play a vital role to boost agricultural production and economic return can be increased to the farmers.
- The use of animal drawn puddler, manual cono weeder manual rice transplanter, manual pre-germinated rice seeder, self-propelled rice transplanter and multicrop thresher have tremendous scope for mechanizing different agricultural operations for paddy cultivation in the State.
- The use of animal drawn seed cum fertilizer drill and animal drawn inclined plate planter, have good scope for promotion in the pulses and oilseeds-growing region of Chhattisgarh.

Threats

- Fragmented small land holdings limit the use of inputs and farm machinery.
- Traditional hand tools cause problem of low output capacity and human drudgery and low yields.
- There is no mechanization strategy in the State for sustainable agricultural development.
- The fertilizer use, hybrid seeds and good quality tools are not available in the close vicinity of farmer's fields.
- Due to low wages in agricultural sector there is migration of people from villages.
- Low literacy in the State, diminishes progress in agricultural sector.
- Sale of forest based produce by tribals at lower prices and no value addition of farm produce.
- No market for high capacity efficient machinery.

29. LONG-TERM PROGRAMMES AND STRATEGIES FOR AGRICULTURAL MECHANIZATION

- For increasing yields and cropping intensity agricultural mechanization policy should include:
- Increasing income of agricultural workers to reduce inequality reduction.
- Mechanization of the farms of all categories.
- Reducing health hazards and increase safety in operation of farm machinery.
- Conserving and properly utilizing natural resources such as land and water.
- Improving utilization efficiency of inputs such as seeds, chemicals, fertilizers and energy.
- Reducing cost of production.
- Increasing power input to 1.5 kW/ha by the year 2020.
- Custom hiring high capacity farm machines for timeliness of operation where turn around time is low.
- Improving management of farm machinery
- Mechanization of hill agriculture
- Mechanization of paddy, groundnut, fruits and vegetable crops and covered cultivation
- Improving quality of manufacture of farm machinery
- Strengthening R&D—manufacturer linkages.

Strategy of Improved agricultural implements and machinery for crop production:

- (a) Modern scientific agriculture requires adequate improved variety of seeds, fertilizer, assured irrigation, plant protection measures, energy and

improved machinery for appropriate mechanization. Besides, technology packages are necessary to reduce post harvest losses through processing for higher economic return.

- (b) Financial incentives should be provided for purchase of improved agricultural equipment to all the farmers. The farmers located in tribal dominated backward regions should be provided special incentive for purchase and use of improved machinery to facilitate agriculture and agro-processing.

Farm Power

Draught animal power will remain the chief source of tractive power dominated regions who practice hill agriculture and shifting cultivation due to topography. To ensure adequate farm power for timely farm operation, animal power should be supplemented with mechanical and electrical power. The quality of draught animals will be improved through feed management and regulated breeding. Uneconomical and marginal lands should be developed for fodder production, pasture and grazing lands.

Infrastructural improvements

There are abundant water resources in the State. For proper development and utilization of surface and underground water in an integrated manner, region specific water resource planning is essential, including methods to increase *in-situ* water conservation, ground water recharge, water distribution and utilization.

POLICY ISSUES**Coordination of agencies related with mechanization**

- The government in cooperation with R&D institutions and manufacturers should work out a mechanism to plan for development and introduction of farm machinery for mechanization of specialized crops, horticulture and agro-forestry.
- Developmental activities similar in nature being undertaken by various agencies related to equipment and machinery for land development, levelling, mechanization and pressurized irrigation (Directorate of Agriculture, Directorate of Agricultural Engineering, Agro Industries Development Corporation and Land Development Corporation), should be examined to reorganize and to be executed by one agency so as to make it more effective.

Futuristic Approach

The State currently has an area of 0.82 million ha which is under double cropping. By 2010, 100% of the total net cropped area would be made suitable for double cropping. The State currently has an irrigated potential of approximately 1.34 million hectares and would increase this irrigated potential to 4.02 million hectares by 2010. The bullock drawn implements requirements should be five folds to bridge the mechanization gaps in the State. The growth of tractor population and irrigation pump should be at 5% per annum during 15–20 years.

(B) Jharkhand State

1. BRIEF SCENARIO

The Jharkhand State comprises of 22 districts and three sub zones, viz. Central and north eastern plateau, western plateau and south eastern plateau. The central and north eastern plateau accounts for 23.8% of the area and 15.4% of the total population of the State. The zone is characterized by humid to sub-humid tropical monsoon type of climate. In this zone 8.2% of the gross cropped area is irrigated. Tanks and large diameter wells are the major source of irrigation. The rice is main crop in the both up land and low land situations. The soils are lithologically controlled. This entire zone has mono cropping system. The zone comprises of the district Hazaribagh, Girdihi, Santhal parganas, Dhanbad and about 1/3 of Ranchi. The average annual rainfall is 1,321 mm. The Chotanagpur plateau in Jharkhand, slopes both towards north and south.

The western plateau occupies 14.32% of the total area of the State. The population in this zone is 4.5% of the State's population with a density of 134 persons/km². This zone comprises the Palamau, Gumla, Loha dega, Chatra sub-division of Hazaribagh, hilly southern part of Gaya, Aurangabad and Rohtas district. The total area is 14.32% of the total State. Only 24.5% area is under cultivation and 12.79% of the cultivated area receives irrigation. This is drought prone zone. The zone is ideally suited for horticultural crops viz mango, jackfruit, guava, banana, litchi citrus, papaya, pears and ber. Mango is principal fruit of this region. In vegetables, potato and tomato are extensively cultivated. There is need of development of suitable rainfed farming technologies based on soil and water conservation, ponding, recycling for utilization of limited water resources of the zone. The promotion of short duration oilseeds crops (viz sesame linseed and safflower) and pulses (*moong, urad, arhar* and gram) for light texture shallow depth soil of

the region. There is need of promotion of suitable dryland technology for fruits, viz. guava, papaya, ber, amla and sweet lime. There is need of development of suitable rainfed farming technologies based on soil and water conservation, ponding, recycling for utilization of limited water resources of the zone. The promotion of short duration oilseeds crops (viz. sesame linseed and safflower) and pulses (*moong, urad, arhar* and gram) for light texture shallow depth soil of the region. There is need of promotion of suitable dryland technology for fruits, viz. guava, papaya, ber, amla and sweet lime.

The southern eastern plateau zone consists of Singhbhum district occupying 10.6% of the total area of the State. The population in the zone is 4.1% of the population of the State with a density of population of 213 persons/km². The average annual rainfall is 1,304 mm. The zone forms part of southern fridge of the Chotanagpur plateau and is hilly upland tract. This zone has 31.70% net sown area. The zone has mono cropping system having paddy area of 89% of cropped area of zone with average yield of 4.5 q/ha. The Swarnarekha project has increased possibility for good yield of wheat, pulses and oilseeds.

There is need of development of suitable rainfed farming technologies based on soil and water conservation, ponding, recycling for utilization of limited water resources of the zone. The promotion of short duration oilseeds crops (viz. sesame linseed and safflower) and pulses (*moong, urad, arhar* and gram) for light texture shallow depth soil of the region. There is need of promotion of suitable dryland technology for fruits, viz. guava, papaya, ber, amla and sweet lime.

2. MAJOR OBJECTIVES FOR MECHANIZATION

The easy credit facilities and subsidy are required for purchase of improved equipment in the State. The sale centres for improved equipment and their spare parts should be available in near vicinity of a cluster of villages. The training of local artisans should be organized to take repair of such implements at the doorstep of users. The constraints in agricultural mechanization are small size of holdings, undulating topography, low draft of animals, poor financial conditions of farmers illiteracy, unawareness about improved implements lack of repair facility in rural areas. The horticultural mechanization is required in the region by introducing digging fork, weeding fork, hand cultivator, pruning secateur, budding and grafting knife, manual fruit harvester, Dutch hoe, garden rake and weeding trowel.

The manual garlic planter is the identified equipment for small farmers. In the State, hiring rate of animal pair without operator is Rs 50/day. The tractor with cultivator thresher is available in hiring charges of Rs 150/day. In the State, the availability of power from average bullock pair is 0.4–0.5 hp. The water holding capacity of upland is poor. In upland, paddy, pigeon pea, maize and *ragi* are grown. In irrigated land wheat, potato, gram, rapeseed etc are taken in *rabi* season.

There is need of suitable crop-livestock mixed farming technology. The improved technology for growing fruits (Jack fruit, *ber*, mango) should be promoted in Santhal Parganas region. For small tribal farmers suitable mixed farming system needs to be promoted. The emphasis should be given on integrated watershed management for crop production in dryland in Central and North Eastern plateau. The seeded preparation is performed using animal drawn *desi* plough and Birsa ridger plough. There is no mechanization in sowing operation at farmers level. For inter-culture, *khurpi*, *kudali* and Dutch hoe are in use. For plant protection, manually operated sprayers have been introduced in the region. Still harvesting is practiced using local sickle. For fruits (mango, guava, litchi sweet lime and *ber*) harvesting there is no mechanization. The bullock treading and beating with stick are most commonly used methods of threshing. In vegetable cultivation there is no mechanization in planting operation. For all the crops except paddy, the sowing is performed by dropping the seeds behind the country plough. For horticultural crops, the pits are dug manually. The output capacity of threshing varies 15–20 kg/h using hand beating method. Presently planting of potato is done manually resulting in fatigue of the worker. Still the animate power is dominating in the State which requires small hand tools and animal operated improved equipments.

3. IDENTIFICATION OF THE MECHANIZATION PACKAGE

The rice crop needs mechanization in seedbed preparation, seeding and transplanting, interculture, harvesting and threshing operations. The package of improved equipment identified for mechanization in rice are animal drawn peddlers, manual rice transplanter, manual rice seeder, manual cono weeder improved sickle, self-propelled vertical conveyor reaper and pedal operated/motorized paddy thresher. The animal drawn groundnut digger has been demonstrated and further promotions of digger can mechanize harvesting operations of groundnut crop.

The animal drawn planter and animal drawn Birsa

digger can bridge the mechanization gap in potato growing region of the State. The pedal operated paddy thresher has immense potential to mechanize threshing operation in tribal belt. For mechanizing sowing operation, the introduction of manually operated mustard drill, rotary dibbler, manually operated low cost seed drill, manual garlic planter and animal drawn seed cum fertilizer drill can save labour, cost of operation and costly seeds. For maize threshing tubular maize sheller and rotary hand maize sheller can minimize human drudgery. The grubber, Dutch hoe and dryland weeder have been introduced for mechanizing interculture operation. The manual fruit harvester should be introduced to minimize human drudgery and good quality of fruits.

4. BENEFITS OF MECHANIZATION PACKAGE FOR ALL CATEGORIES OF FARMERS

In Chotanagpur region the common farmers are still using their old traditional type of implements. The average farmer of the State is poor with undulating land and small holding size.

Through front line demonstration of package for different cropping pattern for different power sources and categories of land holdings in close coordination with Directorate of agriculture, and the State Agricultural Universities. Under Central/State subsidy programmed for tribals, SC/ST and marginal/small land holdings the benefits of mechanization package should be ensured and feedback on their uses should be obtained. For using improved equipment package, trainings on operation, adjustment and repair—maintenance should be conducted at block levels.

5. BRIEF SCENARIO OF FARM POWER AVAILABILITY

The availability of total farm power in the State is 0.75 hp/ha. Most of the agricultural operations are performed by animate power sources. The mobile farm power sources are not used in the State. The stationary farm power sources, viz. Irrigation pump and electric motor are commonly used in irrigated area. The availability of human power is 0.50 hp/h. The availability of animal power is 0.70 hp/ha. The availability of mechanical power is 0.25 hp/ha.

In the State, small hand tools, viz. *Kudali*, *Khurpi*, local sickle, spade are commonly used for cultivations of different crops by tribals in irrigated land, animal drawn ridger plough, animal drawn seed drill, Dutch hoe, Japanese paddy weeder, pedal operated paddy thresher

and local power thresher are most commonly used farm equipment. In fifteen to twenty years in next 15–20 years, there is need of selective mechanization in different agricultural operations in rainfed crops. The emphasis should be for promotion of small hand tools and animal drawn improved farm equipment in the Chotanagpur region. The requirements of improved equipments should have a growth rate of 5% to introduce mechanized cultivation in the State.

6. DIVERSIFICATION OF AGRICULTURE

In Jharkhand State, the promotion of horticultural crops using modern irrigation facilities can boost the economy of farming community. In rainfed region of the State, pulses (*moong*, *urad*, *arhar*) and fodder crops (maize, sorghum, *berseem* and *bajra*) should be grown in tribal region. There is a need to diversify agriculture in this region through cultivation of medicinal plants and cash crops like ginger and turmeric. The cultivation of vegetables and fruits needs to be supplemented with dairying and poultry enterprises in irrigated region of the State.

7. PRESENT INFRASTRUCTURE AND PROGRAMMES OF AGRICULTURAL MECHANIZATION

The trainings of improved implements are organized for rural youth, farmers and subject matter specialists of KVK/ARS at Birsa Agricultural University, Ranchi. The farmers are demonstrated improved implements for different agricultural operations under front line demonstration programme. In the rice cultivation, manual rice seeder, manual cono weeder, self propelled vertical conveyor reaper have been demonstrated by AICRP on FIM Centre at BAU, Ranchi. The manufacturing of small hand tools was performed at prototype production centre at BAU centre of AICRP on FIM. The prototype feasibility of improved farm machinery is the regular activity of FIM centre located at BAU Ranchi. The extension activities of package of improved implements should be accelerated by KVK and agricultural research stations and ICAR Institutes in close coordination with Department of agriculture.

8. PRESENT SCENARIO FOR EDUCATION AND TRAINING OF ENGINEERS

The trainings of the Engineers, Diploma holders are arranged at Department of Agricultural Engineering, Birsa Agricultural University, Ranchi. The training programmes are also arranged at Central Lac Research

Institute, Ranchi and Krishi Vigyan Kendra of agricultural university/ICAR

9. R&D AND TESTING FACILITIES

Under Department of Agricultural Engineering, Birsa Agricultural Engineering there is centre of AICRP on Farm Implements and Machinery which conducts R&D work of agricultural engineering through prototype feasibility testing and front line demonstration of improved equipments. The Krishi Vigyan Kendra, Divyam, Ranchi R&D work is performed for agricultural mechanization. At Ranchi, Central Lac Research Institute conducts R&D work for improved technologies of lac suiting to the mechanization gap of the State. CIAE has got opportunity to test self propelled vertical conveyor reaper for paddy in Jharkhand State.

10. PRESENT SCENARIO OF AGRICULTURAL MACHINERY MANUFACTURE AND SERVICE FACILITIES

There are 14 identified manufacturers of agricultural implements who are engaged in production of Birsa ridger plough, Birsa potato digger, MB plough (10 cm size), Dutch hoe, grubber, pedal operated paddy thresher and improved sickle. The prototype production centre also caters needs of farmers to meet their demand of improved implements. The centre also liaison with the manufacturer of agricultural of implements to promote proven designs. The manufacturers also arrange supply of farm equipment from the neighbouring States. The manufacturers of agricultural implements are also trained to use standard production techniques through CIAE, Bhopal.

11. EXISTING FACILITIES FOR GETTING NEW DESIGNS OF IMPROVED MACHINERY

In 22 districts of Jharkhand State, on the basis of the mechanization gaps for different agricultural operation and power sources need of the equipment is identified. Keeping in view the human power and draught animal power, improved implements are designed and tested in the laboratory then test trials are conducted at research farm to finalize equipment for field-testing at farmers field. The equipment developed are tested to ensure safety and comfort to the operator. The manufacturers are provided engineering drawing/computer aided design and are provided training in the standard production technique for saving in cost of production and wastage of raw material. Manufacturers. There are liaisoned for monitoring quality of improved farm equipment.

12. PROJECTIONS OF REQUIREMENTS OF DIFFERENT TYPES OF MACHINERY

In the Central and North Eastern plateau, tanks and large diameter wells are the major source of irrigation. The rice is main crop in the both up land and low land situations. The soils are lithologically controlled. In the western plateau. mango is principal fruit of this region. In vegetables, potato and tomato are extensively cultivated. There is need of development of suitable rainfed farming technologies based on soil and water conservation, ponding, recycling for utilization of limited water resources of the zone. The southern eastern plateau zone forms part of southern fridge of the Chotanagpur plateau and is hilly upland tract.

This zone has 31.7% net sown area. There is no mechanization of any agricultural operation in cultivation of fruits, and vegetables. Most of the operations are performed by conventional manually operated hand tools. The animal power is used in the State for sowing, interculture and digging, threshing (bullock treading) operations of crops. There is no mechanization in plant protection operation of any crop in the State. These are given in Table 2.

13. BRIEF SCENARIO OF THE EXISTING EQUIPMENT/TECHNOLOGIES USED BY THE FARMERS TO REDUCE LOSSES

There is no equipment/technologies used by the farmers to reduce losses, specially of perishables and semi-perishables. on-farm/villages level processing of agricultural produce can be performed with simple low cost equipments for different crops. The adoption will help in enhancing the quality of produce. There is need to promote small solar dryers, zero cool chamber, pedal operated cleaner cum grader, small oil expeller, low capacity cold storage mini dal mill, manual groundnut decorticator. There is need to impart training on processing equipment to upgrade there quality of agricultural produce during post harvest operations.

14. TECHNOLOGY PARKS

A display centre for improve technologies of lac has been established at Central Lac Research Institute, Ranchi. At FIM Centre, Birsa Agricultural University, Ranchi agricultural implements display centre is functioning to create awareness about use of improved technology.

There is need to establish Farm equipment display centre at each district level to promote agricultural mechanization. In different regions of the State, front line demonstration activity should be strengthened by

Table 2. Projection of requirements of farm implements and machinery in Jharkhand State

Name of Important machinery	Number of machinery			
	2000	2005	2010	2020
Animal drawn improved bakkhar blade	10	100	1,000	10,000
Animal drawn Inclined planter	3	50	200	500
Animal drawn seed-cum-fertilizer	100	1,000	5,000	10,000
Manual mustard drill	5	50	300	1,000
Animal drawn potato planter	–	50	500	1,000
Anima drawn ridger	10	100	500	2,000
Animal drawn puddler	100	700	2,500	10,000
Manually operated paddy thresher	200	1,000	10,000	50,000
Dutch hoe	200	1,000	10,000	25,000
Animal drawn Groundnut harvester	20	200	500	1,000
Manual groundnut decorticator	10	100	500	2,000
Japanese paddy weeder	100	500	5,000	20,000
Self propelled vertical conveyor reaper	–	20	100	200
Improved sickle	200	1,000	5,000	30,000
Tubular maize sheller	200	2,000	10,000	20,000
Manual I rotary dibbler	–	100	1,000	5,000
Manual garlic planter	–	50	300	600
Manual rice transplanter	5	50	200	1,000
Manual rice seeder	–	50	500	2,000

covering more districts for different crops. A centre of agricultural processing activity should be established to create awareness for value addition. The agri-clinics should be encouraged to accelerate pace of agricultural mechanization.

15. PRESENT SCENARIO OF CROP RESIDUE MANAGEMENT

There is no existing method for crop residue management in the Jharkhand State. The use of animal drawn improved bakkhar blade, animal drawn MB plough and animal drawn disc harrow should be promoted for incorporation of straw left due to harvesting of previous crops. The surplus biomass should be utilized for preparation of briquette

16. WATER MANAGEMENT

There is need to formulated strategy for water

management in the Chotanagpur region by introducing low lift pump. In the irrigated land drip irrigation sets should be promoted for horticultural crops by providing incentives. The medium farmers should be encouraged to adopt sprinkler sets for judicious use of irrigation water. Under dryland farming, water harvesting small ponds should be constructed to conserve rainwater for dry spell and subsequent crops. For conveyance of irrigation water HDPE pipes should be promoted to enhance water use efficiency and reducing water losses.

17. SCOPE OF COVERED AND PROTECTED CULTIVATION

In initial stage, the covered cultivation and protected cultivation should be demonstrated to farmers especially in vegetable growing region. Due to faster growth of crop and better quality products such practices should be promoted by providing subsidy and imparting training to progressive farmers. The plastic mulching demonstrations should be conducted at research farm of BAU, Ranchi. These can be introduced at few places with the active Govt. support and subsidy during the current plan period for selected crops.

18. ESTABLISHMENT OF LABORATORY FOR QUALITY TESTING

There is no export of agricultural produce from Jharkhand State. However there is need to promote export of pulses, oilseeds, horticultural and forest produce by establishing export zones. These export zone should also provide tax rebates and incentives to progressive farmers. For improving quality of produce the farmers should be displayed and trained for material handling, packaging and storage to up grade the quality for export.

19. STORAGE AND MARKETING OF PERISHABLE AND SEMI-PERISHABLE PRODUCE

For storage and marketing of perishable and semi-perishables there is no cold storages, cool chains in the State. The method of collection and sale of perishable and semi-perishables materials are traditional which are not able to preserve quality of bulk produce. The small capacity grader (for potato) and cold storage/cool chains should be introduce in the initial stage to create awareness among farming community.

20. TECHNOLOGY PACKAGE OF PRODUCTION AND PROCESSING OF AGRICULTURAL EXPORT ZONES

There is no items under export in the agricultural

sector from Jharkhand State, however, improved technologies for material handling and packaging of fruits and vegetables may change the scenario. The agricultural possessing technology for oil seeds, pulses and horticultural produce can be made available to the subject matter specialists of State Agricultural University/KVKs through CIAE, Bhopal and CIPHET, Ludhiana.

21. ROLE OF IT AND KIOSKS

The State has not advanced in agricultural mechanization due to poor economy and unawareness about use of improved farm equipment. The illiteracy among farmers and small size of land holdings are the main reasons for the poor functioning of IT and Kiosks centres. For providing information about improved farm technologies, Department of agricultural engineering is playing key role.

22. LAND REFORMS

In the Jharkhand, land reforms should be performed after receiving first hand information about categories of land holdings, irrigated land and dryland in the State. The computerization of agricultural land records will help policy makers in the State. For promotion of mechanization, land reforms should be continued to reduce further fragmentation of lands. There are more difficulties in mechanized agriculture if land fragmentation continues in the State. Therefore, there is need to create awareness in the villages for reducing fragmentation of land to ensure use of improved equipment for achieving higher land and labour productivity. In too small fields, it is difficult to move machinery for different agricultural operations.

23. AGRI-CLINICS/CUSTOM SERVICE CENTRES

Agri-clinic and custom service centre concept is the need to transfer improved cultivation technologies/equipment in the State. The modern agriculture requires judicious use of input like seed, organic/chemical fertilizers, and chemicals. In Jharkhand custom care centre can play a vital role to boost agricultural production and economic return can be increased to the farmers. Through custom services for seedbed preparation, sowing, planting, weeding, plant protection, harvesting threshing etc there is immense potential to provide employment for agricultural graduates/agricultural engineers in the Jharkhand State.

24. SETTING UP OF A STATE LEVEL AGRICULTURAL MECHANIZATION BOARD

Dissemination of technology requires strong network of research engineers, extension engineers, manufacturers and progressive farmers. The review of on-going programmes related to agricultural mechanization is continue at Department of Agricultural Engineering, Birsa Agricultural University, Ranchi which is regular activity under prototype manufacturing, front line demonstration, prototype feasibility testing and custom hiring activity technology transfer division.

For more active participation of agencies like Directorate of Agriculture, Directorate of extension, BAU, Ranchi, Central Lac Research Institute and KVK need of setting up of a State level Agricultural Mechanization Board headed by the minister of agriculture. All blocks; in each districts should have a sales and service centre of improve farm equipment. The extension engineers should be accountable for front line demonstrations of improved farm equipment; for different agricultural operations. These equipment should also be promoted on custom hiring through involving large farmers/entrepreneurs.

25. AGRICULTURAL MECHANIZATION POLICIES AND ISSUES

Since, Jharkhand State has negligible mechanization in different agricultural operations for the existing cropping pattern, there is a need to promote selective mechanizing in tribal belt using small hand tools for reducing human drudgery. The seedbed preparation operations should be mechanization by promoting animal drawn implements, viz. Birsa ridger plough, disc harrow and improved bakhar blade. The seeding operation for maize can be mechanized using manually operated Naveen dibbler in tribal belt. For harvesting operations improved sickle and for shelling maize tubular maize sheller are most suitable and recommended equipments. For irrigated land package of identified equipment should include animal drawn MB plough, animal disc harrow, BAU animal drawn ridger, CIAE animal drawn improved bakhar blade, CIAE animal puddler, PAU manual rice transplanter, TNAU manual rice seeder animal drawn three time cultivator, CIAE, animal drawn seed cum fertilizer, IISR animal drawn potato planter, animal drawn potato/groundnut digger and manual fruit harvester. For efficient threshing pedal operated/motorized paddy thresher should be promoted in the State.

26. HIGHER ALLOCATION OF FUNDS FOR AGRICULTURAL MACHINERY

Under Central subsidy/subsidy from Jharkhand State Govt. are covering few farmers and still majority of tribal and small farmers are unable to purchase improved equipment due to their higher cost. Providing higher allocations for Agril. Machinery will definitely make bright chances for rapid mechanization. In the State credit up to Rs 1 lakh; is required for purchase of animal drawn matching improved equipment for the average farmer having land holding more than 2 ha. For irrigated land, farmers should be provided minimum Rs 3 lakh credit for mechanized farming.

27. SEPARATE NORMS FOR FIELD LINE DEMONSTRATIONS

In Jharkhand State, front line demonstrations of improved equipment the fund requirements are quite high, separate norms are required for FLD of different types of machinery. The expenses incurred on transport, operators/labour, seeds, fertilizer and chemicals are quite high which require about Rs 1,000/ha for successful demonstration. The crop demonstrations do not require costly inputs.

28. COLLECTION OF RELIABLE DATA

The arrangement for collection of reliable data, monitoring of agricultural mechanization is continue at FIM Project centres located at Birsa Agricultural University, Ranchi. In the State, the information on existing conventional equipment, no and addresses of agricultural implements manufacturers with their product range have been collected in the farm implements manufacturers survey. The computerized information of production and sale of improved implements is yet to be prepared for web site. There is need of strengthening continuous process for collecting regular information on production and sale of agricultural machinery in the State. A monthly-published document is required which can focus production and sale of improve equipment in the State.

The mechanization strategy recommended for Jharkhand State should include:

- (i) mechanizing tribal belt of Chotanagpur region using small hand tools.
- (ii) introducing package of animal drawn equipment for different crops in rainfed regions of the State.
- (iii) mechanizing agricultural operations in horticultural crops.

- (iv) mechanizing different operations under rice cultivation.
- (v) conducting front line demonstrations of improved equipment for different crops.
- (vi) manufacturing small hand tools and animal drawn implements to meet the demand of the farmers through involving agricultural implements manufacturers.
- (vii) mechanizing hill agriculture in the State
- (viii) promoting processing of agricultural produce for employment generation through value addition of raw material.
- (ix) promoting modern irrigation equipment and methods (sprinkler/drip irrigation).
- (x) mechanizing rice cultivation through promotion of puddler, rice seeder, rice transplanter, cono weeder and pedal paddy thresher.

29. SWOT ANALYSIS OF MECHANIZATION PROGRAMME

Strengths

- The State has Birsa Agricultural University, Ranchi and Central Lac Research Institute, Ranchi, which contribute in sustainable agricultural development.
- Qualified human resources serve the State with the present network of ICAR Institute and agricultural university.
- The prototype manufacturing activity of FIM Scheme at BAU, Ranchi plays a key role in mass manufacturing of improved implements and also imparts regular training on use and repair of improved equipments.
- The industrial liaisoning has motivated the State's farm machinery manufacturers. The front line demonstrations and custom hiring of improved equipment have been initiated under the jurisdiction of State Agricultural University.
- The annual use of bullock pair be increased to run centre of value added products from raw farm produce. The equipment package available for animate sources can play effective role in balanced farm mechanization.
- The State has good scope for horticultural mechanization. The more subsidized equipment and custom hiring of equipment should be accelerated in the State.
- Birsa ridger plough, Birsa animal drawn seed drill, Dutch hoe, Japanese paddy weeder and Birsa

animal drawn digger have been widely accepted in the State.

- On medium and large farms, disc harrow, multicrop thresher, reapers have shown good impact among farmers when demonstrated through KVK's.

Weaknesses

- Net irrigated area is only 8% of total sown area in the State.
- The illiteracy and poverty are the main hindrance, which slow down the farm mechanization in the State.
- The hybrid seeds, fertilizer use and plant protection spray is beyond the reach of poor farmers in marginal and small land holding categories.
- The vegetables and horticulture cultivation have not been mechanized which resulted in more human drudgery and poor yields.
- The 75% of State has not adopted mechanized farming due to poor investment capacity and unavailability of improved equipment in their respective regions.
- The network for supply of improved equipment and after sales service are poor in Jharkhand.

Opportunities

- The western plateau (drought prone zone) has good scope for horticultural crops like mango, jackfruit, guava, banana, litchi, citrus, papaya, pears and ber.
- This zone can use weeders, potato planter and diggers for reducing human drudgery. In the central and northeastern plateau rice cultivation needs to mechanize.
- The animal drawn puddler, manual rice seeder, manual rice transplanter, manual cono weeder, pedal operated and motorized hold on paddy thresher, self propelled vertical conveyor reaper are have potential for adoption as equipments for rice crop package.
- The southern eastern plateau zone has potential to adopt dryland-farming equipments for oilseeds, pulses and fruits cultivation. The manually operated rice cultivation equipments (cono weeder, rice seeder, rice transplanter, improved sickle) have opportunities to introduce for reducing human drudgery.

Threats

- The farm power availability/ha is very low in the State.
- The State has mostly marginal and small land holdings.
- The State has mostly drought prone districts in which rainfed farming is prevalent.
- The literacy rate is very low in the State, which hinders agricultural development.
- There is shortage of food, feed and fibre, which forces tribals in cities to forfeit.
- The manufacturing units of farm implements are limited which are not able to bridge the mechanization gaps.
- The commercialization of improved implements is at a very slow rate.

30. LONG TERM PROGRAMMES AND STRATEGIES FOR AGRICULTURAL MECHANIZATION

- The mechanization strategy recommended for Jharkhand State should include:
- Mechanization of tribal belt of Chotanagpur region using small hand tools.
- Introduction of package of animal drawn equipments for different crops in rainfed regions of State.
- Mechanization of agricultural operations in horticultural crops.
- Mechanization of different operations under rice cultivation.
- Conducting front line demonstrations of improved equipments for different crops.
- Manufacturing small hand tools and animal drawn implements to meet the demand of the farmers through involving agricultural implements manufacturers.
- Mechanization of hill agriculture in the State.
- Promoting processing of agricultural produce for employment generation through value addition of raw material.
- Promoting modern irrigation equipment and methods (sprinkler/drip irrigation).
- Mechanization of rice cultivation through promotion of puddler, rice seeder, rice transplanter, cono weeder and pedal paddy thresher.

(C) ORISSA STATE**1. BRIEF SCENARIO**

Orissa lies in the sub tropical belt in the Eastern

Region. The State covers an area of 155.4 lakh ha of which 60.48 lakh ha is cultivated and the total cropped area is 84.25 lakh ha. About 56 lakh ha lands are under forests. There are 10 sub agro climatic zones in Orissa under two major Agro Climatic Zones of India. The State has coastal region, Eastern ghat region, Northern plateau and Central Table land. The State has 8 soil types, namely, red sand and loamy, lateritic, red yellow, coastal alluvial, deltaic alluvial, black, mixed red and black and forest soils. The State has hot and dry summer, hot and humid wet season and autumn season. The State receives annual rainfall of 1,490 mm and gets rainfall mostly by South West monsoon and also by North East Monsoon. There were major draughts as well as severe cyclones affecting the agriculture in a significant way. Orissa agriculture depends much on monsoon rains. The vagaries of monsoon play havoc causing scarcity of food grain production in draught and flood by excess rainfall. The North Western part of Orissa is highly moisture deficit, 20.9 lakh ha of lands of Orissa are irrigated of which 9.5 lakh ha is by canals, 3.05 lakh by tank and 8.36 lakh ha by tube wells. The major crops in the State are rice, pulses, coconut, chillies, groundnut, mustard, millets and sugarcane and cashew nut, mango and papaya. Rice is grown in 44.34 lakh ha of which 16.3 lakh ha only is irrigated. Ragi and millets are important dry land crops and black gram, green gram and horse gram are the important pulses. Groundnut, niger and mustard are major oilseed crops. Horticultural crops like mango, banana, papaya, coconut, cashew nut and guava are also grown.

The productivity of major crops in Orissa is, 1,130 kg/ha for rice, 650 kg/ha for ragi, 360 kg/ha for pulses, 52.4 t/ha for sugarcane and 900 kg/ha for chillies. More than 85% of the population lives in rural areas and among the workers of 125 lakhs, 45% are farmers and 29.2% are agricultural labour.

The North Western and North Central zones are a plateau at 300 m height with undulating and rolling topography of uplands and terraced lands. The hills have thick forests. The East and South Eastern and North Eastern Coastal line is the rice bowl of Orissa and aquaculture and marine fisheries are also well developed. North Eastern, Eastern and South eastern ghat zones have warm and humid climate and have millets and vegetables and paddy, ginger and turmeric as main crops. Cattle and goat rearing is popular in this sub zone. The central table land zones have canal irrigation of Hirakund reservoir.

There are 36 lakh farm holdings in the spread over 50,000 villages. The land holdings are mostly small and

medium, accounting for 77.4% in number but 41.7% of the area. 94% of the holdings are below 4 ha. Large holdings account for only 22.6% of the holdings, covering 58.3% of the area. The average size of marginal holdings is 0.5 ha, that of small holdings is 1.4 ha and the large holdings are 3.8 ha. The productivity is the lowest in these holdings of size 4 ha and below and no improved

implements are used. Only 0.5% of the holdings, operating 6.35% of total area, i.e. 3.34 lakh ha, are having tractors, power tillers, pump sets and sprayers. Therefore, utilisation of even improved bullock drawn implements are very low and use of power operated machinery is almost negligible. Sub-agro climatic zones of Orissa State with their characterisation is given in Table 3.

Table 3. Agro Climatic Sub Zones of Orissa

S.No.	Agro-climatic zone	Agril. districts	Climate	Normal			Soils
				Main Annual rainfall (mm)	Mean maximum summer temp (°C)	Mean minimum winter temp (°C)	
1.	North Western Plateau	Sundargarh Bolangir Deogarh	Hot and moist sub-humid	1,600	38.0	15.0	Red and yellow soil light texture
2.	North Central Plateau	Mayurbhanj Keonjhar	Hot and moist sub-humid	1,534	36.6	11.1	Red loam light textured
3.	North Eastern Coastal Plain	Balasore, Bhadrakh Jajpur Keonjhar	Moist, sub-humid	1,568	36.0	14.8	Alluvial soil, narrow strip of sedimentary sand loam to clay textured
4.	East and South Eastern Coastal Plain	Cuttack Jagatsinpur Kendrapara Puri, Ganjam	Hot and humid	1,577	39.0	11.5	Loam, clay loam, coastal alluvial, narrow strip of saline inundated area
5.	North Eastern Ghat	Khurda Nayagarh Gajapati Rayagada Phulbai Boudh		1,597	37.0	10.4	Brown and forest soils, sandy loam, loamy and clay, medium textured
6.	Eastern Ghat High Land	Koraput Nawarangpur	Warm and humid	1,521.8	34.1	7.5	Mostly red with low organic matter content
7.	South Eastern Ghat	Jeypore Malkangiri	Warm and humid	1,710.4	34.1	13.2	Red, red and yellow mixed soils
8.	Western Undulating	Kalahandi Nuapara	Hot and moist, sub humid	1,352.3	37.8	11.9	Black-heavy and red light soils. Mixed red and black soils, medium to heavy texture
9.	Western Central Table Land	Sambalpur Baragarh Bolangir Sonepur	Hot and moist, sub humid	1,614	40.0	12.4	Light to medium texture. Red soils and heavy textured calcareous soils
10.	Mid Central Table Land	Dhenkanal Anugul Cuttack Jajpur	Hot and moist, sub humid		38.7	14.0	Light textured lateritic, medium textured red loam soils and mixed red and black soils

2. MAJOR OBJECTIVES FOR MECHANIZATION

With more than 77% of holdings being small and marginal, bullock drawn improved manual operated implements and small hp engine powered machinery would be the right approach for mechanization and large size holdings may be provided with high capacity machines.

Therefore, the major objectives of mechanization for this State has to be with special thrust for providing ergonomically improved bullock drawn and manual tools to reduce the drudgery of labour, at the same time, the farm power availability has to be increased to a reasonable level of about 2.0 kW/ha in the next 10 years to achieve higher yields, atleast on par with national average. Larger machinery like tractor, combines and medium size machinery like power tillers and self propelled reapers and transplanters may be introduced for custom hiring. More area has to be brought under irrigation, by increasing the reservoir command area, by digging more bore wells and open wells, and with increased electric power availability to farm sector.

3. MECHANIZATION PACKAGE

Since more than 94% of the holdings are marginal, small and semi medium, the mechanization package for this State should be with more emphasis on improved hand tools and bullock drawn implements on ownership basis. Power tillers and tractors may be introduced on custom hiring basis. Bullock drawn country and iron ploughs, sickles, pedal operated thresher, bullock drawn puddler are some of the implements being used presently.

The improved implements recommended for adoption by farmers are improved sickles, long handled weeders and hoe, garden rake, bullock drawn improved ploughs and improved puddler, zero till drills, 5 tyne cultivator (BD), 5 tyne cultivator (light weight power tiller), power reapers, power threshers, light weight power tillers and power weeders, bullock drawn planters and seed drills, bullock drawn ground nut diggers, decorticators, power sprayers and dusters, electric powered pump sets, tractors with matching implements, tractor drawn rotavators, sugarcane equipments like planter, ridger etc, paddy transplanters and other improved machinery.

4. PRESENT SCENARIO OF AGRICULTURAL MACHINERY MANUFACTURE AND SERVICE FACILITIES

There are about 160 SSI manufacturing units of implements located in Angul, Balasore, Cuttack, Dhenkanal, Ganjam, Jharsuguda, Kalahandi,

Kendrapara, Keonjhar, Khurda, Koraput, Malkangiri, Mayurbhanj, Nayagarh, Nuapara, Phulbani, Rayagada, Sambalpur and Sundargarh districts. These units manufacture bullock drawn implements, hand tools and tractor attachments. The Orissa Agro Industrial Corporation (OAIC) and Orissa Small Industries Corporation (OSIC) are also involved in production and marketing of agricultural implements. There is a State Government Implement Factory which is involved in prototype development of promising designs suitable for Orissa. Government sales centres under OAIC have been established for supply of agricultural implements to farmers in different districts. These are inadequate considering the magnitude of development that has to be take place in the mechanization front in the State. The service and repair facilities in rural areas are not adequate.

5. ADOPTION OF NEW IMPROVED MACHINERY BY MANUFACTURERS

Manufacturers located in the State are mostly manufacturing bullock drawn implements and hand tools. OUAT, Central Rice Research Institute, Regional Research Laboratory are associated in identifying and making available the designs of new equipments to the Prototype Development. Centre of the Government Implement Factory, which in tern provides the technology to SSI manufacturing units for commercialisation.

6. INFRASTRUCTURE FOR EXTENSION OF AGRICULTURAL MECHANIZATION

With the launching of a new agricultural policy by State Government, emphasis is given on extension programmes to increase the level of mechanization in the State.

The extension wing of Department of Agriculture has been mobilised to popularise the agricultural machinery through popularisation of power driven and self-propelled machinery. In the Work Plan of the State Government on Macro Management Mode under Central sponsored schemes, demonstrations of the selected agricultural machinery are held in different places and the equipments are supplied to farmers under special subsidy for equipments like 35 hp tractors, power tillers, tractor operated rotavator, self propelled reapers, paddy transplanters, bullock drawn and manually operated plant protection equipment for rice, jute, sugarcane etc. Under different agricultural mechanization programmes, about 5,600 tractors, 33,200 hand tools like weeders, pedal

operated thresher, decorticator, manual transplanter; 4000 power threshers, 44,000 hand operated sprayers, 19,000 pump sets, 2,500 sprinklers and 8,200 low lift pumps have been supplied to farmers by the State government during 2000–2004.

7. SETTING UP OF STATE LEVEL AGRICULTURAL MECHANIZATION BOARD

The State level technical committee of Orissa for Agricultural Mechanization may be changed in to Agricultural Mechanization Board with similar objectives and more action plans. District level implementation agencies and block level agro clinics/primary processing centres may be established.

8. R&D AND TESTING FACILITIES

The State government has identified the State Level Technical Committee, Prototype Development Centre, FIM Centre of OUAT, Agricultural Engineering Division of CRRI, Cuttack and Rural Technology Division of RRL, Bhubaneswar for testing and evaluation of equipments approved by Government for supply to farmers under subsidy. However, the State needs better testing facilities and a Farm Machinery Testing Centre may be established. Quality of the equipment under supply by Government are being inspected by Senior Engineers of OSIC, OAIC and Agricultural Engineering Wing of Department of Agriculture.

9. IMPACT OF URBANISATION

The rural population of Orissa has reduced from 93% to 85% during the past 4 decades and hence, there is a trend towards urbanisation which would necessitate the agricultural mechanization in rural areas in the years to come.

10. PRESENT LEVEL OF MECHANIZATION

The draught animal power and human muscle power still remain major power sources for agriculture in the State while mechanization is being introduced through various centrally sponsored schemes and is taking place gradually. There is a trend to opt for self propelled and small power operated equipments and power tillers by the farmers. The government has carried out many popularisation programmes under Work Plan on Agriculture on Macro Management Mode. The equipments to be popularised under Agricultural Mechanization Work Plan of the State Government are tractors, power tillers, tractor operated rotavator, self propelled reapers, power operated equipments for

horticulture, bullock drawn/manually operated implements. There are about 4.46 tractors only in every 1,000 ha area in the State and the tractor power availability has to be increased by atleast 3 times by 2015 for meeting additional power required in the farms. Power tillers have to be popularised in a big way on ownership basis in medium and large farm and on custom hiring basis in small and marginal farms.

11. EQUIPMENT FOR POST HARVEST TECHNOLOGY

Post harvest of agricultural produce is a neglected area and it requires immediate attention. Post harvest equipments for on-farm processing of farm produce may be popularised by conducting Front Line Demonstrations. The rice processing mills and cashew industries may be modernised.

12. TECHNOLOGY PARKS

Display centres on Mechanization of Pre-production and post production technologies may be set up at KVKs to be made in each district.

13. WATER MANAGEMENT

Water management and efficient use of available water to command more area should be given top priority. Many low lift pumps are in use in low lands but more area may have to be brought under irrigation in the State from the present level of 34% of area under irrigation to about 45%. Rain water harvesting and storage to improved recharging of ground water is to be advocated vigorously. Use of direct seeders for both rainfed and irrigated rice would reduce water requirement considerably and increase the yield in rice broadcasted areas. Drip and sprinkler irrigation equipments may be promoted in horticultural orchards and vegetables, specially in chillies, to obtain higher yield with less water.

14. STORAGE AND MARKETING OF PERISHABLE AND SEMI-PERISHABLE PRODUCE

Deep freeze storage facilities for fruits and low cost cool chambers for vegetables may be established in potential area for enabling the farmers to hold up their produce from spoilage when there is a glut in the market. This would help in getting better and stabilized prices for the perishable produce.

15. ROLE OF IT AND KIOSKS

The information Kiosks to be established all over the country would enable farmers to have access to all

information regarding machinery and their availability from their villages itself. Technical guidance on production and post production operations for various crops may be also is obtained.

16. LAND REFORMS

The fragmentation of land should be stopped any further for successful mechanization and the consolidation of lands by forming SHGs/Cooperatives, contract farming would facilitate the adoption of more efficient agricultural machinery.

17. AGRO SERVICE CENTRES/PRIMARY PROCESSING CENTRES

The State Government has set up 500 Agro Service Centres in the 14 cyclone affected districts of Orissa where the entrepreneurs have been supplied with implements and machineries like tractor with matching implements, power tiller, self propelled reaper, threshers etc worth Rs 5.6 lakhs with subsidy for Rs 2 lakhs. In some irrigated command areas, the World Bank has given 100% assistance amounting to Rs 6 lakhs for agro service centres. However, the functioning of these agro service centres need to be monitored for their effectiveness and more such agro service and primary processing centres may be established in each block. The availability of adequate trained manpower for judiciously operating these equipments has been a constraint. The repair and maintenance of these equipments has also been a problem. Rural youth having ITI qualifications may be trained in such operation and maintenance of this machinery before entrusting the Agro Service Centres to them. Tractor and power tiller manufacturers may be asked to provide such trainings to village youths in this backward State. The Agricultural Engineering staff of the Government may also be trained in new machinery before they are introduced in the field.

18. CREDIT FACILITIES AND INSURANCE FOR AGRICULTURAL MECHANIZATION

The Orissa farmers are lagging behind in modernisation of agriculture. Liberal credit facilities should be provided matched with special subsidies/grants through Government sponsored special schemes. The loans may be given by mortgaging the agricultural machinery only being purchased from the loan. The cyclone affected and tribal areas may be given a special status in introduction of mechanization through bank credit. Insurance may be rationalized to cover the loss due to natural calamities and non-use of machinery due to crop failure.

19. AGRICULTURAL MECHANIZATION POLICIES AND ISSUES

The major agricultural mechanization policies to be adopted to address the issues have been discussed and on some of the important aspects are enumerated below.

Sustained demonstrations and large scale front line demonstrations are to be organised to create awareness amongst the farmers on new machinery. The State government may assign higher priority for this programme by allocation of more funds and also should gear up the extension engineers of the State departments.

- (i) Progressive farmers and peers in adoption of mechanization may be identified and taken to mechanized States to study the impact of mechanization in order to inspire them.
- (ii) Agricultural machinery manufacturers and tractor manufacturers from all the parts of the country may be invited to exhibit their products through Implement/Machinery shows to be organised at each district.
- (iii) Equipments for mechanization of horticultural crops like vegetable planters, furrower, cultivator, pit hole digger, power weeders may be given special subsidy to give greater thrust.
- (iv) Post harvest processing of produce requires a boost and On-farm processing of the farm produce may be encouraged and popularised.
- (v) Agro Service Centres may be strengthened and more agro service centres may be established to promote rural entrepreneurship and custom hiring. Special subsidies may be given.
- (vi) Self Help Groups may be promoted to start such Agro Service cum Processing Centres.
- (vii) Credit for mechanization for this State requires a special consideration with adequate liberalisation.
- (viii) Package of multicrop implements/equipments (versatile) for the different sub zones in the State may be identified and popularised.
- (ix) Agricultural Engineering Wing of the State should be strengthened to shoulder increased responsibilities for identifying and popularising of agricultural machinery and On-farm post harvest technology for value addition.
- (x) Training programmes at different levels for village youth in operation and maintenance of equipments and entrepreneurship, for State government officials in executing mechanization programmes and for progressive farmers in proper use of the equipments should be organised vigorously round the year.

- (xi) Special mechanization programmes for cyclone affected and tribal areas may be intensified.
- (xii) Water Management Techniques may be propagated in delta regions and command areas to bring in more area under irrigation.
- (xiii) The gender bias in mechanization has to be addressed to and women friendly equipments are to be introduced.
- (xiv) The productivity for all crops in the State has to be increased to above national average level by fixing targets and evolving special programmes to achieve the targets.
- (xv) State Level Technical Committee may be reformed as a State Mechanization Board with district and block level supporting agencies for effective implementation of mechanization.

20. SWOT ANALYSIS OF MECHANIZATION PROGRAMME

Strengths

- There are 160 SSI manufacturing units of implements in the State.
- The State government has set up 500 Agro Service Centres.
- In the Orissa State, 28% of total gross domestic product is achieved from Agricultural sector.
- In the Orissa State, 65% of the total population is based on agriculture and 80% of the villages are electrified.
- The major crops of the State are rice and sugarcane.
- The ICAR Institute namely Central Rice Research Institute, Cuttack and Orissa University of Agriculture and Technology, Bhubaneswar play a key role in sustainable agricultural development.
- The main power source is bullock power, which has almost all matching equipments for different agricultural operations.
- The commonly improved implements like seed drill, cultivator, MB plough, disc harrow puddler, ridger, potato digger, groundnut planter, multicrop thresher, wire-loop threshers, self propelled reaper are manufactured by State manufacturers.
- The State Agricultural University and KVK's are playing vital role in farm mechanization through training program and front line demonstrations.
- The Orissa State Agro Industrial Development Corporation caters the need of matching implements for different crops.

- The commonly improved implements like seed drill, cultivator, MB plough, disc harrow puddler, ridger, potato digger, groundnut planter, multicrop thresher, wire-loop threshers, self propelled reaper are manufactured by State manufacturers in Orissa State.

Weaknesses

- There are more than 77% of holdings being small and marginal, there is scope for introducing manual and bullock drawn implements.
- The region is affected due to drought, flood and cyclone.
- The small land holdings have low investment capacity, which restricts mechanizing agricultural operations with greater inputs.
- The farmers are not aware about use and maintenance of improved implements especially puddlers, rotavator, rice transplanter, seeder and self propelled reaper.
- The power tillers use is restricted due to irregular after sales service from present network.
- The value addition technologies of post harvest produce are not in operation.
- The agri-clinic have not been promoted to facilitate mechanized farming.
- The draft animal power is dominating but breeds used in the State are small.

Opportunities

- The State has good potential to mechanize all agricultural operations for rice. The package for rice cultivation equipments should be promoted for reducing human drudgery with greater output capacity.
- The groundnut planters and diggers (bullock drawn/power tiller mounted) have good scope in the State agriculture.
- The wireloop threshers, reapers, manual rice seeders have good opportunities if subsidized and multiplied at faster rate in the State.
- Power tiller mounted rotavator, cultivator, reapers are equally important to bridge the mechanization gaps in the State.
- The tractor mounted sugarcane sett planter should be promoted being sugarcane as chief crop.

Threats

- Failure in maintaining the desired level of mechanization and post harvest management can lead to overall losses.

- Educated youth will shun agriculture accentuating socio-economic issues.
- In view of the diminishing contribution to agriculture GDP, agricultural development in general and its mechanization in particular may be relegated to a position of low priority.
- The drought cyclone and continuous rains causes threats to sustainable agril. Development.
- In its anxiety to absorb more people in agricultural sector, the State may deliberately discourage mechanization.

21. LONG-TERM PROGRAMMES AND STRATEGIES FOR AGRICULTURAL MECHANIZATION

There are 36 lakh farm holdings in the spread over 50,000 villages. The land holdings are mostly small and medium, accounting for 77.4% in number but 41.7% of the area. 94% of the holdings are below 4 ha. Large holdings account for only 22.6% of the holdings, covering 58.3% of the area. The average size of marginal holdings is 0.5 ha, that of small holdings is 1.4 ha and the large holdings are 3.8 ha. The productivity is the lowest in these holdings of size 4 ha and below and no improved implements are used. Only 0.5% of the holdings, operating 6.35% of total area, i.e. 3.34 lakh ha, are having tractors, power tillers, pump sets and sprayers. Therefore, utilization of even improved bullock drawn implements are very low and use of power operated machinery is almost negligible.

Major objectives of Mechanization

- With more than 77% of holdings being small and marginal, bullock drawn improved manual operated implements and small hp engine powered machinery would be the right approach for mechanization and large size holdings may be provided with high capacity machines.
- Therefore, the major objectives of mechanization for this State has to be with special thrust for providing ergonomically improved bullock drawn and manual tools to reduce the drudgery of labour, at the same time, the farm power availability has to be increased to a reasonable level of about 2.0 kW/ha in the next 10 years to achieve higher yields, atleast on par with national average. Larger machinery like tractor, combines and medium size machinery like power tillers and self propelled reapers and transplanters may be introduced for custom hiring. More area has to be brought under irrigation, by increasing the reservoir command

area, by digging more bore wells and open wells, and with increased electric power availability to farm sector.

Mechanization Package

The improved implements recommended for adoption by farmers are improved sickles, long handled weeders and hoe, garden rake, bullock drawn improved ploughs and improved puddler zero till drills, 5 tynes cultivator (BD), 5 tynes cultivator (light weight power tiller), power reapers, power threshers, light weight power tillers and power weeders, bullock drawn planters and seed drills, bullock drawn ground nut diggers, decorticators, power sprayers and dusters, electric powered pump sets, tractors with matching implements, tractor drawn rotavators, sugarcane equipments like planter, ridger etc., paddy transplanters and other improved machinery.

Present Scenario of Agricultural Machinery Manufacture and Service Facilities

- There are about 160 SSI manufacturing units of implements located in Angul, Balasore, Cuttack, Dhenkanal, Ganjam, Jharsuguda, Kalahandi, Kendrapara, Keonjhar, Khurda, Koraput, Malkangiri, Mayurbhanj, Nayagarh, Nuapara, Phulbani, Rayagada, Sambalpur and Sundargarh districts. These units manufacture bullock drawn implements, hand tools and tractor attachments. The Orissa Agro Industrial Corporation (OAIC) and Orissa Small Industries Corporation (OSIC) are also involved in production and marketing of agricultural implements. There is a State Government Implement Factory, which is involved in prototype development of promising designs suitable for Orissa. Government sales centres under OAIC have been established for supply of agricultural implements to farmers in different districts. These are inadequate considering the magnitude of development that has to be take place in the mechanization front in the State. The service and repair facilities in rural areas are not adequate.
- Progressive farmers and peers in adoption of mechanization may be identified and taken to mechanized States to study the impact of mechanization in order to inspire them.
- Agricultural machinery manufacturers and tractor manufacturers from all the parts of the country may be invited to exhibit their products through implement/machinery shows to be organized at each district.

- Equipments for mechanization of horticultural crops like vegetable planters, furrower, cultivator, pit hole digger, power weeders may be given special subsidy to give greater thrust.
- Post harvest processing of produce requires a boost and On-farm processing of the farm produce may be encouraged and popularized.
- Agro Service Centres may be strengthened and more agro service centres may be established to promote rural entrepreneurship and custom hiring. Special subsidies may be given.
- Self Help Groups may be promoted to start such Agro Service-cum-Processing Centres.
- Credit for mechanization for this State requires a special consideration with adequate liberalization.
- Package of multicrop implements/equipments (versatile) for the different sub zones in the State may be identified and popularized.
- Agricultural Engineering Wing of the State should be strengthened to shoulder increased responsibilities for identifying and popularizing of agricultural machinery and On-farm post harvest technology for value addition.
- Training programmes at different levels for village youth in operation and maintenance of equipments and entrepreneurship, for State government officials in executing mechanization programmes and for progressive farmers in proper use of the equipments should be organized vigorously round the year.
- Special mechanization programme for cyclone affected and tribal areas may be intensified.
- Water Management Techniques may be propagated in delta regions and command areas to bring in more area under irrigation.
- The gender bias in mechanization has to be addressed to and women friendly equipments are to be introduced.
- The productivity for all crops in the State has to be increased to above national average level by fixing targets and evolving special programmes to achieve the targets.
- State Level Technical Committee may be reformed as a State Mechanization Board with district and block level supporting agencies for effective implementation of mechanization.

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