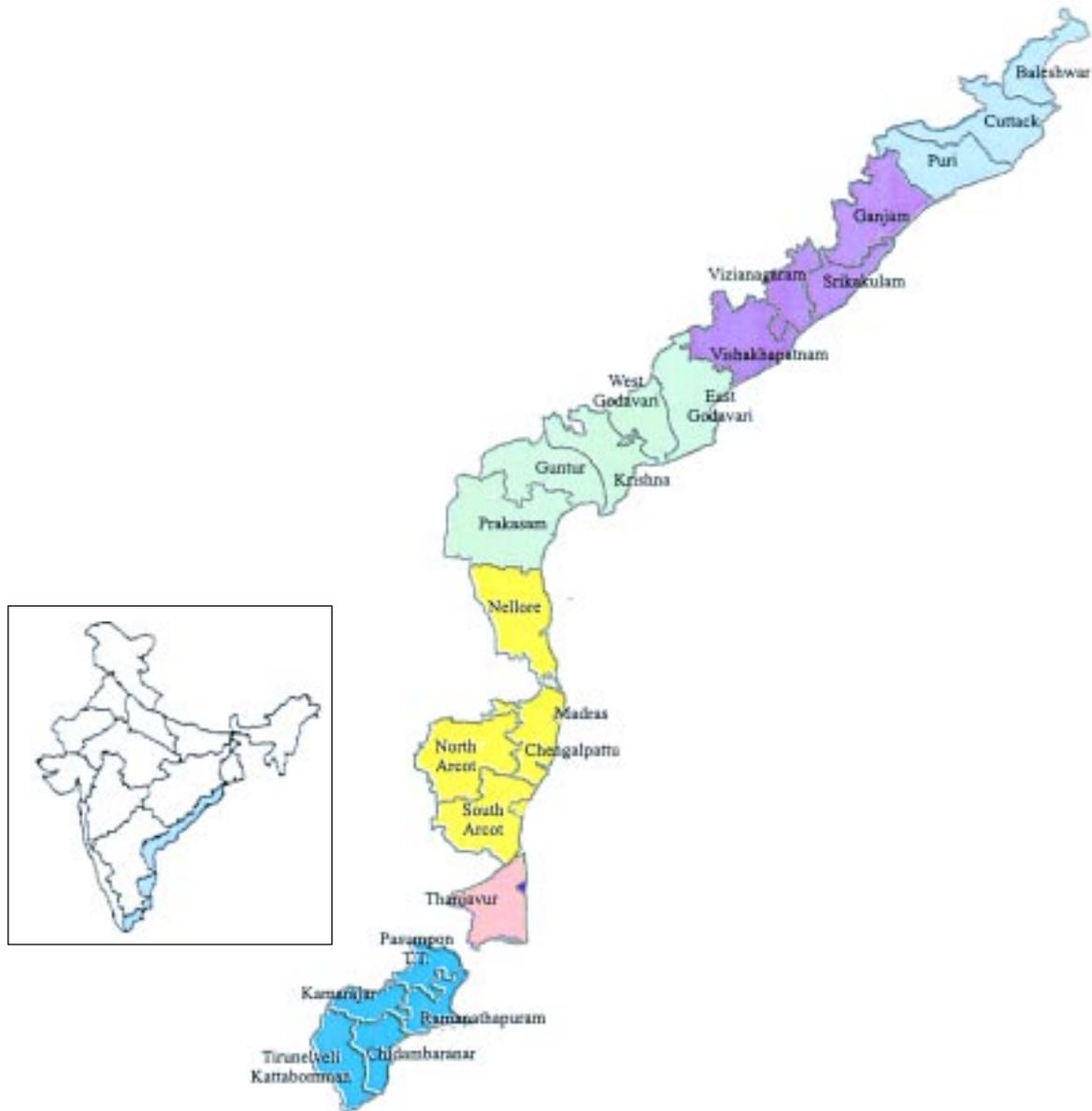


Long-term Strategies and Programmes for Mechanization of Agriculture in Agro-climatic Zone–XI : East Coast Plains and Hills region

Dr S.J.K. Annamalai
Principal Scientist and Head
CIAE Industrial Extension Centre, Coimbatore

1. NAME OF AGRO CLIMATIC ZONE: East Coast Plains and Hills region
2. STATES UNDER THIS ZONE : Tamil Nadu, Andhra Pradesh, Orissa and Pondicherry



3. SUB-AGRO CLIMATIC ZONES WITH THEIR CHARACTERIZATION

This zone covers parts of Orissa, Andhra Pradesh and Tamil Nadu and Pondicherry. There are six sub-zones and these are discussed below.

3.1 Orissa coastal region

This is the relatively prosperous part of Orissa. 56% of the area is cultivated. Irrigation support is moderate, at 44%. Cropping intensity is 174%. The sub-zone covers the districts of Baleshwar, Cuttack and Puri. It receives nearly 1,300 mm of rainfall, the climate is moist sub-humid and the soil is deltaic and coastal alluvial. The region faces constraints of waterlogging and salinity.

3.2 North coastal Andhra and Ganjam

This sub-zone runs down the east coast from Ganjam in Orissa to Vishakhapatnam in Andhra through Srikakulam and Vizianagaram. The region receives over 1,000 mm rainfall, the climate is sub humid and the soil is coastal alluvial. In Ganjam, the soil is red loamy coastal alluvial. The sub-zone lies in the coastal basin on the rivers Godavari and the Krishna which provide much of the irrigation. However, since the rivers are in level or in some parts even below sea level, drainage, salinity and floods are the major limiting factors in agricultural development. Forest cover is quite high at 28% and only about 38% of the area is cultivated.

3.3 South coastal Andhra region

This sub-zone is very similar to the North Coastal Andhra belt. It includes East Godavari, West Godavari, Krishna, Guntur and Prakasam districts of Andhra Pradesh. The area under cultivation is higher than in the north, at about 45% and irrigation is better. Land productivity is higher.

Rainfall is below 1,000 mm, the climate is semi-arid to sub humid and the soil is coastal alluvial.

3.4 North coastal Tamil Nadu region

This includes Nellore district of Andhra Pradesh and Chengalpattu, Madras, North Arcot and South Arcot of Tamil Nadu. The region receives a little over a thousand mm of rainfall, the climate is semi-arid and the soil is red loamy sandy coastal alluvial. About 36% of the land is cultivated. Almost 60% of the net sown area is irrigated. Cropping intensity is not very high but the land productivity is quite high.

3.5 Thanjavur region

This includes only the Thanjavur district of Tamil

Nadu. A relatively large proportion of its land, about 62%, is cultivated and nearly 85% of the cultivated land is irrigated. The area grows essentially rice, but the cropping intensity is high at 151 and the land productivity is much higher than the State average. The district receives 1,110 mm of rainfall, the climate is semi-arid to dry sub humid and the soil is deltaic alluvial red loamy.

3.6 South coastal Tamil Nadu region

This sub-zone is located at the southern tip of the peninsula. It includes the districts of Kamara-jar, PM Ramanathapuram, Ramanathapuram, Tuticorin and Tirunelveli. Rainfall is quite scanty averaging 780 mm per annum. The climate is semi-arid and the soil is red and black coastal alluvial. About 40% of the land is ploughed and only 29% of the sown area is irrigated.

4. GENERAL TOPOGRAPHY OF THE ZONE WITH BRIEF HISTORICAL BACKGROUND OF AGRICULTURAL DEVELOPMENT OF THE ZONE

The zone lies in sub-tropical belt in the east coast and it has a hot and dry summer with temperature shooting upto 42°C. This zone receives rainfall in both South West and North East Monsoon.

This zone is a traditional rice growing region as it is benefited by the flow of major rivers of the peninsular region. The zone is predominantly flat coastal area with the eastern ghats in the adjoining area. This zone has a rich historic culture mingled with art having been ruled by Cholas and Pandyas in Tamil Nadu and the Kalingas in Orissa. The land is very fertile with the nutrient rich historic sediment soils brought by the flowing rivers and agriculture is the backbone of the region. Maritime fishing is another important vocation for the coastal people.

5. OPERATIONAL LAND HOLDING PATTERN BY MAJOR SIZE GROUP

The pattern of land holdings in this zone are more fragmented with 87.89% of the total number of holdings in Andhra Pradesh and Tamil Nadu and 77% of holdings in Orissa being marginal and small farms. The average holding size is 1.03 ha in this zone, which is less than All India average of 1.41 ha. By area, 42.67% in Andhra Pradesh, 15.27% in Orissa and 53.8% in Tamil Nadu are under marginal and small holdings.

6. IMPORTANT SOIL TYPES AND CROPS

- (a) **Soil types:** The soil types are predominantly Red loam and Black cotton in Andhra Pradesh, Red

non calcareous, Black soil and Sandy loam in Tamil Nadu and Alluvial sandy loam, Loam clay loam and Coastal alluvial in Orissa. There are also narrow strips of saline water inundated areas.

- (b) **Important crops:** The major crops of this zone are paddy, sugarcane, groundnut, mustard, sorghum, maize, other millets, pulses, vegetables, banana, coconut, mango, cashew nut and orchard crops. Oil palm cultivation is being promoted in the Coastal Andhra.

Cropping Pattern

Three distinct cropping systems namely, *kharif*, *rabi* and summer seasons are seen in Andhra Pradesh. It is generally paddy–paddy–pulse, or paddy–paddy–green manure or sugarcane–fallow. North Eastern Coastal region in the low lands in Orissa have paddy–mung system or Jute–paddy–pulses pattern while the rainfed medium and uplands have paddy–mustard or Jute–paddy–mustard or Ragi–mustard/mung. In the East and South East Coastal region of Orissa, Rice–Rice or Rice–Pulse/groundnut or Rice–potato–rice, Early rice–vegetables are grown. Wheat is also grown in some areas in Orissa.

7. CLIMATE AND ANNUAL RAINFALL

Sub Humid climate prevails in this Zone. This zone receives rainfall in South West and North East Monsoon. The rainfall received in this zone is 500–700 mm in Tamil Nadu, 800–1,100 mm in Andhra Pradesh and 1,500 mm in Orissa

8. POPULATION AND POPULATION DENSITY OF THE ZONE

The density of population in the States coming under this zone has been 236 in Orissa, 478 in Tamil Nadu, 2,029 in Pondicherry and 275 in Andhra Pradesh. The population density is found to be higher in the coastal districts in the respective States than the upland areas.

9. BRIEF SCENARIO OF AGRICULTURE SECTOR

This zone is predominantly the rice bowl of Tamil Nadu, Andhra Pradesh and Orissa. It has several important rivers namely, Mahanadi, Godavari, Krishna, Cauvery and Vaigai flowing towards East to the Bay of Bengal, irrigating vast delta area and providing irrigation lifeline to the crops. Bay Of Bengal Sea had been unkind to this East coast belt over the years, with super cyclones lambasting the coast repeatedly during North East Monsoon. These devastating cyclones had caused huge

loss of lives (human and cattle), agricultural crops, damage to soil fertility status and many more irrecoverable losses. In the past 35 years, severe cyclones have hit the Orissa and Andhra Coast 9 times. Paddy and Banana were the major crops damaged by this calamity causing losses to the tune of several thousand crores of rupees. The dry summer causes severe drought situation.

About 56.4% of area under food crops in the districts of Andhra Pradesh in this zone is cultivated for rice and the production of rice from these districts account for 57% of rice produced in whole State. The area under rice in the districts of this zone in Tamil Nadu is 19,06,004 ha which is about 90% of the State, producing about 90% of State's total rice. In Orissa, major area out of 4,41,300 ha under rice is grown in this zone. Most of the area under rice in Orissa is rainfed and has less productivity. The productivity of rice in this zone is 2,000–3,000 kg/ha in Andhra Pradesh, 3,500 kg/ha in Tamil Nadu and 1,100–1,500 kg/ha in Orissa. There is tremendous scope for increasing the productivity.

10. BRIEF SCENARIO OF ANIMAL HUSBANDRY SECTOR

There are about 144.8 lakh livestock in the coastal districts of Tamil Nadu which constitute about 56% of the cattle population in the whole State. There are about 39.3 lakh cattle, 2.2 lakh buffaloes, 9.2 lakh goats and 21 lakh poultry birds in the districts falling under this zone in Orissa. This zone is coming under medium draught animal power intensity area.

11. BRIEF SCENARIO OF FISHERIES SECTOR

Fresh water aquaculture is adopted in Orissa in low land areas as paddy cum fish culture. Marine fisheries enjoy an Exclusive economic zone of 0.56 million sq. km. in the Bay of Bengal on the East Coast. The marine and inland fish production in Andhra Pradesh is 1.5 and 0.91 lakh tonnes respectively. Brackish water aquaculture is the recent system of fish farming in these maritime States, particularly in Nellore and other coastal districts of Andhra Pradesh

12. IRRIGATED AREA AND SOURCE OF IRRIGATION

55% of the total cropped area in Tamil Nadu, 44.1% in Andhra Pradesh and 29.5% in Orissa are irrigated. The irrigated area under rice has been 93.2% in Tamil Nadu, 95.7% in Andhra Pradesh and 40.7% in Orissa. 87% of area of 24,38,110 ha under rice in the districts of Andhra Pradesh in this zone are irrigated. 100% of area under wheat and sugarcane are irrigated in Orissa, 70.3% of area

under groundnut in Andhra Pradesh is irrigated. The main sources of irrigation in this zone has been through the perennial rivers of Godavari, Krishna in Andhra Pradesh, Mahanadi in Orissa and Cavery and Vaigai in Tamil Nadu. Tube wells and filter point well irrigation is also being done in coastal belts. In Orissa 9,49,000 ha out of the net irrigated area of 20,90,000 ha is by canal irrigation, 3,05,000 ha is by tank irrigation and 3,00,000 ha is by tube well irrigation. In Tamil Nadu 51.2 and 48.8% of the total net irrigated area are by canals & tanks and wells respectively, while in Andhra Pradesh 52.1 and 43.3% are irrigated by canals & tanks and wells respectively.

13. INFRASTRUCTURAL FACILITIES AVAILABLE IN THE ZONE

13.1 Metalled Roads

The road facilities are good in Tamil Nadu, Pondicherry and Andhra Pradesh, while the network of roads in Orissa is rather poor.

13.2 Rural Electrification

The rural electrification scenario is diverse in this zone with Tamil Nadu, Pondicherry and Andhra Pradesh having total electrification in the rural areas while in Orissa, 74.98% of the village were electrified. 43.35% of electricity consumed in Andhra Pradesh, 27.18% in Tamil Nadu and only 3.22% in Orissa have been for agricultural purposes, whereas, the national average of electricity consumption for agricultural purposes has been 26.77%. The energisation of pumpsets, which is an indicator of electrification in agriculture, has been more than 17 and 19 lakh in numbers in Tamil Nadu and Andhra Pradesh, occupying third and second positions in the country respectively, while it has been below 75,000 in Orissa. The rural electrification network requires considerable improvement in Orissa.

13.3 Important markets for sale of farm implements and machinery/grain mandies

All the leading manufacturers of tractors and power tillers have their showrooms in major town in this zone. Kisan markets and regulated markets for agricultural produces are available in Tamil Nadu and Andhra Pradesh. Major industrial cities at Chennai, Vishakhapatnam etc and harbours at Chennai, Tuticorin, Vizag, Paradeep are located in this zone

13.4 Infrastructural facilities available for manufacture of agricultural implements and Machinery

Major agricultural machinery manufacturers are

located in the neighbouring zones at Coimbatore (Tamil Nadu) and Hyderabad (Andhra Pradesh). There are many small manufacturers located in the zone. Agro Industries Corporations in Andhra Pradesh and Orissa coordinate the supply of implements/machinery under subsidy scheme to the manufacturers. Good service facilities and dealer network are available in Tamil Nadu and Andhra Pradesh but these are inadequate in Orissa. The small machinery manufacturers in other zones, who supply machinery to farmers in this zone, do not have any service network and hence farmers face the problem of timely repair of their machineries when they breakdown. A few SSI Units manufacturing agricultural implements are located at Cuttack, Bolangir, Keonjhar etc. in Orissa; Cuddalore, Tiruvannamalai, Madurai and other districts in Tamil Nadu; and in Guntur, Vizag, Krishna and West Godavari districts of Andhra Pradesh.

13.5 Infrastructural facilities available for sale/repair and maintenance of tractors and other machinery in the region.

There are very good infrastructure facilities available for sale, repair and maintenance of tractors in the coastal districts of Tamil Nadu, Andhra Pradesh and Pondicherry while the infrastructure available in the districts in Orissa is inadequate.

13.6 Facilities available for extension/training of farmers, artisans/farm women, Entrepreneurs etc.

While there is a good network of agricultural extension system in the State Departments of Agriculture, the facilities for extension of agricultural mechanization either do not exist or are inadequate. The training of artisans/entrepreneurs and other extension programmes are carried out at ICAR Institute and SAUs only.

13.7 Facilities for credit

Facilities for credit are adequately available from the Nationalised Banks, Regional Rural Banks and Cooperative Banks at reduced interest rates for agricultural purposes.

13.8 Incentives, concessions, subsidies available to farmers/manufacturers of agricultural implements.

Subsidies on different types of agricultural machinery are available for different categories of farmers under centrally sponsored schemes. These subsidies are provided to the farmers under the Micro-Management schemes of the State Governments.

13.9 Infrastructure for Execution and Monitoring of Agricultural Engineering Extension Programmes

The infrastructure for execution and monitoring of agricultural engineering extension programmes in the States coming under this zone is inadequate. The Agricultural Engineering Directorates/Agricultural Engineering Wings under the State Departments of Agriculture have been mostly carrying out land development and micro irrigation development activities. The front line demonstrations, training and promotion of agricultural machineries are being mostly carried out by ICAR centres, KVKs and AICRP centres under FIM.

14. AGRICULTURAL IMPLEMENTS BEING USED BY THE FARMERS

These are given in the following Table.

Crop	Operation	Tools/ implements presently being used	Improved implements suggested for introduction
Paddy	Puddling	Tractor with cage wheel/ cultivator, Bullock drawn puddler	Power operated and bullock drawn improved puddlers
	Transplanting	Manual	Transplanters – Manual and self-propelled
	Weeding and interculture	Manual	Cono weeders
	Harvesting	Sickle	Self-propelled reapers, high capacity thresher, combines
	Threshing	Paddy thresher, pedal operated thresher	
	Winnowing	Pedal operated winnowers (Orissa)	Power winnowers
Groundnut	Field preparation	Bullock drawn Ploughs, Tractor drawn cultivator, Harrow	Combination tillage tools, tractor operated equipment

Crop	Operation	Tools/ implements presently being used	Improved implements suggested for introduction
	Sowing	Behind country plough, Bullock drawn seed drills	Tractor drawn planters, improved bullock drawn planters
	Weeding and interculture	Manual hand hoe	Long handle weeder, power wheel
	Harvesting	Manual	Tractor drawn 3–4 row Harvester
	Pod separation	Manual	Power Thresher
	Grading	Not very common	Grader
	Decortication	Manual Sheller	Power Decorticator
Sugarcane	Seed bed preparation	Tractor plough, cultivator, harrow and ridger	Rotary tillers
	planting	Manual	planter (tractor operated)
	Weeding and interculture	Hand spade/ hoe	Power weeder and Off barer and earthing up equipment
	Earthing up	Spade	Earthing up equipment (mini tractor/power tiller operated)
	Harvesting	Knife/Sickle	Harvester (Self-propelled)
	Transportation	Truck, tractor trailer/bullock cart	–
Sorghum and other millet crops	Field preparation	Tractor with cultivator, bullock drawn ploughs	Tractor operated implements

Crop	Operation	Tools/ implements presently being used	Improved implements suggested for introduction
	Sowing	Broadcasting	Cultivator seed planter
	Weeding	Manual	Weeder
	Harvesting	Manual	Fodder harvester
	Ear head separation	Manual	Ear head separator
	Threshing	Trampling with tractor/ bullocks and multi crop thresher	Multi crop Thresher
Vegetables	Nursery	Manual	–
	Field preparation	Bullock drawn ploughs	Tractor operated tillage equipments
	Transplanting	Manual	Single row self-propelled/two row tractor operated vegetable transplanter
	Plant protection	Power sprayer/ knapsack/ rocker arm sprayer	Improved power sprayers, power tiller operated/ self-propelled boom sprayers
	Plucking/ harvesting	Manual	Knife
Banana	Field preparation	Country plough Cultivator (Bullock drawn)	Tractor/Power tiller operated ploughs, trenchers
	Sucker removal	Crow bar and Bill hook	Sucker remover
	Pit making	Crow bar and spade	Auger digger
	Weeding/ interculture	Hoe/Spade	Power Weeder

Crop	Operation	Tools/ implements presently being used	Improved implements suggested for introduction
	Plant protection	Power sprayer/ knapsack/ rocker arm sprayer	Improved power sprayers
	Pesticide application	Power sprayer/ knapsack/ rocker arm sprayer	Improved power sprayers

15. SWOT ANALYSIS OF MECHANIZATION PROGRAMME IN THE REGION

Strengths

1. This zone is predominantly the rice bowl for the States included under it.
2. This zone is blessed with important rivers flowing through it which form the source of irrigation.
3. Marine and inland fish farming has developed well in the maritime States in this region.
4. The zone has the advantage of easy accessibility for all agricultural machinery and equipment in view of its strategic location.
5. Major ports like Chennai, Tuticorin, Vishakhapatnam and Paradeep are located in this zone that would enable the logistics accessibility much easier for export/import.
6. The mechanization trend has already begun in coastal areas in Tamil Nadu and Andhra Pradesh.
7. The agricultural equipment manufacturers are located nearer to this zone and a few small manufactures are located within this zone.
8. A major tractor manufacturer and a few thresher manufacturers are in this zone.
9. Custom hiring concept is coming up amongst the farmers in Andhra Pradesh and Tamil Nadu.
10. Research Institutes, Regional Research Stations and KVKs are located at different places in the zone for R&D efforts in the region and for Transfer of Technologies.
11. The zone has the headquarters of one Agricultural University, one Veterinary University and also three Agricultural Engineering Colleges. Therefore, the availability of technical expertise for mechanization would be assured.
12. Good service and dealership network are available in Tamil Nadu and Andhra Pradesh.
13. SSI units manufacturing small implements are located in many district headquarters in this zone.

Weaknesses

1. This zone is lambasted by cyclones/storms repeatedly during North East Monsoon causing havoc and huge loss of lives, agricultural crops, damage to soil fertility and many more irrecoverable losses.
2. The zone is prone to natural calamities causing setback to developmental programmes and also requiring huge financial compensation for relief and reclamation works.
3. The holdings are highly fragmented making mechanised field operations difficult since individual ownership of larger equipment would not be viable.
4. Due to the impact of urbanization and village youth unwilling to take up arduous field work, there is paucity of labour at peak periods.
5. Inadequate Tractive power and matching implements is a constraint to farming in many areas in this zone.
6. There is a vast gender bias in the wages.
7. Ergonomic consideration in design of hand tools and bullock drawn implements require to be introduced.
8. Hill agriculture needs to be promoted in the hilly and tribal areas in the region, particularly in the North Eastern ghat zone of Orissa.
9. The small hand tools and farm equipment manufactured by small scale industries are to be improved on quality and standardization aspects.
10. The small scale manufacturing units are not quality conscious.
11. The State governments do not have a strong policy on farm mechanization and the State governments would have to be urged/impressed upon to vigorously take up the promotion of farm mechanization.
12. The extension activities for mechanization is carried out mostly by R&D Institutions, that too to a limited extent. Extension activities on agricultural machinery is either totally absent or very meager.
13. The farm equipment/tools available are not women friendly.
14. The farmer is only a producer and not a primary processor of the produce.
15. Value addition to farm produce requires a boost.
16. Non adoption of water harvesting and water management techniques in the delta regions leads to loss/wastage of precious water.
17. The delta farmers in Tamil Nadu often face the

problem of non release of irrigation water from reservoirs due to conflicts/disputes between riparian States which affects agriculture.

Threats

1. Unless group farming/contract/cooperative farming is promoted in a long way, the further fragmentation of holdings would reduce the scope for mechanization.
2. Failure to achieve desired levels of production, productivity and PHT may lead to food shortages, nutritional insecurity and economic losses in the zone.
3. Many imported farm equipment have been introduced recently posing threat to sustainability of indigenous manufacturers.
4. Failure to mechanise the farm at appropriate levels, would result in increased cost of agricultural production forcing the farmers to even reduce their area under intensive agriculture.
5. Failure to provide labour friendly equipment would further discourage the reluctant agricultural labour to take up field work and thus may cause delayed field operations.
6. Absence of primary processing centres and value addition of agricultural produce would continue the heavy losses in post harvest operations in the farm.
7. Disaster/calamity management measures like quick processing of the produce during heavy rains to prevent losses during natural disaster, high security storage structures would help in reducing losses.

Opportunities

1. By adopting appropriate mechanization technology, the productivity can be increased considerably even in marginal farms.
2. The region receives good rains from monsoon and the water table is high in most of the areas. Good water management practices would help in expanding the area under irrigation. Use of drip and sprinkler irrigation can help in increasing water use efficiency, whenever required.
3. Having closer proximity to major ports and economic zone, opportunities for export of agricultural equipment and value added agro products to other eastern countries are very bright.
4. There is good scope for introduction of technologies for production and culture of marine crustacea, mollusks, marine ornamental fishes,

oyster culture etc in traditional marine fishing areas.

5. More fish processing industries would boost the employment and economy of the region.
6. Fruit processing sector can be strengthened.

16. LONG-TERM PROGRAMMES AND STRATEGIES FOR AGRICULTURAL MECHANIZATION IN THE ZONE

Present Status

The level of mechanization varies from each State in this zone. The growth of mechanization is low in Orissa, moderate in Tamil Nadu and above moderate in Andhra Pradesh. Tractors are concentrated more in sugarcane farms. The delta regions in Andhra Pradesh where paddy and sugarcane are intensively cultivated with assured canal irrigation, the mechanization has advanced well. Harvesting and threshing operations are done with self-propelled reapers, threshers and of late with combine harvesters in Andhra Pradesh. In Tamil Nadu delta region, threshing of paddy is fully mechanized with power threshers. In Orissa, in many areas, the pedal operated threshers and winnowers are being used, the power threshers being only a few in number. The sugarcane areas in Tamil Nadu and Andhra Pradesh are tractorised for field preparation and soil pulverization. Planting, weeding and harvesting in sugarcane are to be mechanized.

One major problem in harvesting of *kharif* paddy crop in this zone is that the time of the harvesting coincides with North East Monsoon and cyclone storms cause heavy losses to the crop leaving the fields inundated. The farmer has to reap the submerged paddy with great difficulty, but he is not able to thresh it quickly before the seeds germinate due to high moisture content and humid environment. High capacity threshers are essentially required to be introduced in this zone. The threshed produce has high moisture and it cannot be packed and stored before it is dried below EMC. With sunshine not available, it would be impossible to dry it on the drying floors under sun. Hot air dryers to reduce the moisture content of the produce to safer level to prevent from germination and microbial infestation would be very beneficial to reduce the post harvest losses.

The small and medium rice mills in this zone are obsolete and they are to be modernized. Improved rice hullers and polishers and dhal mills may be established as Agro Processing units at block level along with the Farm Machinery Clinics.

16.1 Challenges

- (i) To bring amicable settlements in disputes involving riparian States for sharing of river waters would be a paramount challenge.
- (ii) To develop methods and structures for disaster/calamity management to face the fury of nature would be another challenge to be met.
- (iii) To improve the productivity of rice in Orissa to higher levels would be a major challenge.
- (iv) To improve the farm power in the entire zone to meet the additional demand so as to achieve higher productivity.

16.2 What is Required

- (a) To mechanize the irrigated agriculture, in paddy and sugarcane, with precision equipment and state-of-art technologies for increased productivity through higher yields and reduced field losses.
- (b) To increase power availability in the entire zone to meet additional demand for power for increasing production and productivity.
- (c) To provide ergonomically improved tools and gadgets in farming operations to reduce the drudgery of human labour and to provide better environment for agricultural labour for higher work efficiency.
- (d) To provide women friendly agricultural tools and equipments for women labour.
- (e) To introduce mechanization in horticultural crops.
- (f) To modernize rice-milling technologies in small and medium mills for higher recovery at reduced cost.
- (g) To introduce straw management technologies.
- (h) To establish farm mechanization clinics and primary processing centres in rural areas to generate more employment for rural youth and to increase the income of farms.
- (i) To develop Bio-Energy Parks for utilisation of plant residues bio-fuels.
- (j) To encourage entrepreneurs/small industries to take up manufacture of farm equipment suitable for this zone.
- (k) To activate disaster/calamity management measures in cyclone prone regions to prevent losses/damage.
- (l) To improvise the fleet of mechanical small fishing crafts in the coastal belt.
- (m) To improve the fish processing units and to develop new fishery products.

16.3 Strategies

Mechanization Package

Since more than 80% of holdings are small and marginal, the mechanization package may have the following components:

- (i) Small farm equipments/tools for small firms on ownership basis.
- (ii) Medium size farm equipments on custom hiring basis
- (iii) Hiring of farm equipments through contract or group farming systems.

Mechanization in the coastal belt of Orissa should be with both bullock drawn, power tiller and tractor drawn implements. More power tillers may be introduced in this region. Improved women friendly tools like cono weeders, long handled manual weeders, groundnut decorticators etc are recommended. Manual and self propelled rice transplanters, mat type nursery techniques, self propelled reapers, power threshers, combines may be introduced under custom hiring for rice. Rotary tillers, improved bullock drawn and tractor drawn seed planters, sugarcane cutter planter, power sprayers, intercultural equipments, power weeders, multicrop threshers and post harvest equipments are also recommended for various crops in this region.

Based on the various mechanization needs, the strategies for agricultural mechanization in this zone are summarized below

16.3.1 Farm Power

1. For increasing the agricultural productivity, the cropping intensity has to be increased for which farm power available in the farms has to be improved. Efficient use of the agricultural inputs like seed, fertilizer, plant protection chemicals, water, machinery should be followed.
2. Availability of adequate farm power for mobile and stationary farm operations should be increased from the present level of about 1.60 kW/ha to about 2.5 kW/ha in Andhra Pradesh; from 0.60 kW/ha to 2.5 kW/ha in Orissa and from 0.90 kW/ha to 2.5 kW/ha in Tamil Nadu, by 2020. The power scenario in villages is highly inadequate to meet the demand for electrical energy for irrigation, threshing & agro processing and value addition operations. The villages should be provided increased electric power by creating higher grid power connectivity for uninterrupted power supply

16.3.2 Improved Agricultural Implements and Machinery for Crop Production

3. The productivity of rice in these zones has to be increased to 5–7 tonnes per hectare by adopting improved varieties, required soil and crop inputs and precision equipments for proper placement of inputs.
4. For achieving timeliness in all the field operations, saving in the cost of operation and energy required, improved tillage equipment like rotavators, moisture conservation tillage tools, precision seed drills and planters for all the major crops in this region would have to be advocated.
5. The small farm equipment like transplanters, weeders, to be used by these small and marginal farmers on ownership basis and larger equipments like self propelled transplanters, combines, sugarcane harvesters, tractor drawn planters and other equipments on custom hiring basis may be advocated.
6. Power Weeders, Off-barers and Earthing up equipment attached to small tractors having fewer wheelbases may be introduced in sugarcane pockets in Orissa and Tamil Nadu.
7. Growth of mechanization is very low in Orissa and it needs special thrust with special mechanization programmes through introduction of power tillers and tractors.
8. In coastal Orissa, improved animal drawn implements like puddlers, improved pneumatic wheel animal carts and improved harnesses and yokes may be provided at subsidized cost to poor and small farmers.
9. The tail end areas in the delta region are heavy deep soils and mechanizing in such areas would be a challenging proposition and suitable equipment for heavy deep soils in wet conditions may be developed.
10. Presently, harvesting is done mostly by using sickles, reapers and combines for rice. For other crops like sorghum, pearl millets, maize, pulses, oil seeds etc., manual sickle harvesting is being done. Mechanized harvesting systems with reapers, combines and power threshers may be introduced. Sugarcane harvesting with self propelled harvesters may be introduced through the sugar mills and the farmers may be urged to adopt wider spacing for mechanization of sugarcane.

11. Threshing of rice, sorghum, some pulses and oil seeds crops are fairly mechanized. Threshing of other crops like maize, groundnut etc. are to be introduced and popularized.
12. High water requirement crops may be diversified to low water requirement and high return crops.
13. For increased production and productivity, water conservation, storage and management practices will have to be improvised with appropriate technologies including precision land levelling and micro irrigation methods
14. In order to make efficient use of available human and animal energy, improved, efficient and ergonomically designed hand tools and matching animal operated equipment for different operations like seed bed preparation, sowing/planting, weeding/interculture etc. should be promoted and popularized.
15. Another issue that has to be addressed to is the gender bias in mechanization and hence women friendly equipments/tools are to be introduced whenever required.

16.3.3 Mechanization of Horticultural Crops

16. Mechanization in orchard crops for various operations including pruning, spraying for tall tree crops, fruit harvesting etc. need to be identified, developed and popularised.
17. Production and post production tools and equipment for vegetable crops are to be developed/modified for adoption. Broad bed forming equipment and vegetable planters may be introduced.
18. Various garden tools for raising of seedlings for fruits, vegetables and floriculture have to be promoted.
19. Plasticulture methods for cultivation of ornamental flowers, herbs and medicinal plants maybe promoted.
20. Green house technology for high value of seasonable vegetables needs greater promotion. Equipment for mechanization of cultivation in green houses will be required to be introduced and popularized.

16.3.4 Biomass Management

21. Equipment for harvesting, retrieval, densification, fortification, handling and transport of crop residues will be required to be introduced in large numbers for making best utilization of straw and other crop residues for feed, fodder and energy.

Crop residue management in future will pose a problem in this zone, particularly during *kharif* harvest when the North East Monsoon rains will be heavier. Straw balers and densifiers may be required in future for efficient and quicker handling of the straw.

22. Equipment for organic farming and manure application in the field may be developed and introduced.

16.3.5 On-farm Post Harvest Technology

23. Efficient post harvest equipment and technology will be needed for various unit operations like cleaning, grading, drying, evaporative cooling, storage, cold storage and handling of farm produce to improve their quality and shelf-life. Efforts should be made to develop suitable mechanism to collect perishable produce from the farmers, store them in cool chambers/cold storage.
24. Post harvest losses could be reduced by promoting Agro-processing activities in the production catchments area by minimizing transport cost thereby increasing the income and employment in rural areas.
25. Being a major rice growing belt, there is tremendous scope for improving and modernising the existing rice mills and establishing primary processing centers for rice and pulses to dry the wet *kharif* and mini rice & dhal mills to make the farmer from a mere producer to a producer – primary processor
26. Coconut processing complexes may be established, at least one for each State, to make value added products for export market and urban markets in Northern India
27. There are a few mango processing industries in Andhra Pradesh and Tamil Nadu for pulp making and for other value added products like pickle, jam etc
28. The fruit processing sector may be further strengthened in this zone by encouraging entrepreneurs to establish more such units of International standards with export oriented approach. These may be located in rural centers to provide employment to rural youth.
29. Cashew nut is grown in this zone but there are only a few cashew processing industries adopting primitive/obsolete technology. Cashew processing industries may be modernised with more efficient extraction of the industrial by product, CNSL (Cashew Nut Shell Liquid).

30. There are about 15 palm oil extraction units in Andhra Pradesh and the quality of palm oil extracted has to be improved to edible oil grade by improving the process techniques.
31. With the development of brackish water and fresh water aquaculture in this zone, particularly in southern coastal Andhra Pradesh, more fish processing industries may be promoted. Manufacturers of aquaculture farming equipments may also be promoted for mechanizing the fish farming.
32. Creation of avenues for alternate employment during off seasons for rural women may be done.

16.3.6 Infrastructural Improvements

33. Testing facilities for agricultural machinery and agro-products for quality control should be developed in the region for the benefit of manufacturers, processors and exporters for improving the quality of their products.
34. Testing facilities are to be adequately created in the Agricultural Engineering Colleges located in this region and they should be empowered for testing and certifying certain types of agricultural machinery.
35. Technology Park/Display Centres on Mechanization of Crop production and processing technologies may be established at district level and the manufacturers may be encouraged to set up sale counters in the centre
36. The role of IT has become very important in this cyclone prone area, where the weather warning systems through the IT Network would fore warn the farmers well in advance to take up measures to save their crops from natural calamities to the extent possible by rescheduling their field operations by contingency plans. The IT Kiosks may provide state-of-art technology to the farmers on production and post production interventions in particular situation.
37. Farm machinery and equipment exhibitions may be organized at important centres every year.
38. Agricultural Mechanization Training Centres may be established in each SAU/State to provide continuous training to extension engineers, farmers, manufacturers, artisans, entrepreneurs in manufacture/running of custom service centres/ Farm machinery clinics/repair and maintenance of workshops and providing contract services for different farm operations etc with emphasis for

- on-farm trainings at block level.
39. For creating awareness amongst the farmers and extension workers, regular programmes should be broadcasted/telecasted on radio and TV networks. Video films on the working of different equipment should be prepared and shown to the farmers. Front line demonstrations of new equipment should be conducted in farmer's fields and large number of farmers should be invited to see the demonstration.
40. Incentives/support and awards are to be given to manufacturers to manufacture good quality equipment at competitive prices. Manufacturers/ Entrepreneurs should be given assistance through Directorates of Agriculture/Agricultural Engineering.
41. A data bank has to be developed and updated to keep a track of the different machinery produced and marketed. These data should be published annually in both in print and available on Internet.
42. Custom hiring through farm machinery clinic: To take the advantage of use of improved high capacity agricultural machinery by all categories of farmers, custom services of agricultural machinery by private entrepreneurs should be encouraged and promoted through establishment of farm machinery clinics. They should be given incentives and long-term loans on concessional rate of interests. This will boost use of efficient agricultural machinery for timely farm operations at reduced cost.
43. To encourage the farmers, manufacturers and researchers for modernizing the farms, agricultural machinery industry and R&D facilities, visit to other States, other countries and regions may be organized for enriching their knowledge and awareness for appropriate adoption
44. Creation of Bio energy plants in villages for producing bio fuels to supplement fuel requirement for agricultural prime movers.

16.3.7 Institutional Framework

45. State Agricultural Mechanization Board: For coordination and proper implementation of agricultural mechanization programmes in the zone, Agricultural Mechanization Board may be set up at State level with adequate statutory powers. To support the State level board, district level Agricultural Mechanization Agency in line

with DRDA and Participatory Self Help Groups to set up Farm Machinery Clinics and Agro Processing Centres at Block level may be established. Assigning targets may monitor the functioning of these Agencies.

46. The existing infrastructure and manpower for identification, planning, execution, guidance and monitoring of agricultural mechanization and agro-processing activities in the State is poor and inadequate. Directorates of Agricultural Engineering may be created in Andhra Pradesh and Pondicherry. There is a strong need for strengthening the activities of Directorates of Agricultural Engineering/Agricultural Engineering wings of department of Agriculture in the States to plan, execute, review, and monitor various programmes related to agricultural mechanization and post harvest activities in the State. A Monitoring Cell should also be established in the Directorate of Agriculture/Agricultural Engineering for this purpose. This Cell should maintain computerized databases and progress reports of all the programmes.
47. The State governments should assign high priority for effective implementation of agricultural mechanization programmes on a Mission Mode approach to achieve the national targets for food production.
48. Special mechanization programmes for Coastal

Orissa, where the tractor population is less than 5 per 1,000 ha and animal operated implements are mostly in use, may be planned.

49. Long term planning for Natural Disaster Management like contingency programmes to save human, standing crops and cattle from heavy losses, immediate relief measures, whenever required.

16.3.8 Policy Issues

50. The State Governments should formulate the policy for agricultural mechanization for effective implementation of agricultural mechanization programmes.
51. Some States have provided free electricity to the farmers and this has no check on indiscriminate use of inefficient equipment by farmers causing heavy energy losses. This policy requires reconsideration and the farmers may be provided electricity at subsidized rates with more incentives on other aspects.
52. The government should encourage the owner of various farm machinery to insure their farm equipments like tractors, power tillers combines threshers etc. by providing attractive premium rate
53. Liberalization of credit policies for agricultural machinery may be further implemented with special concessions.

□