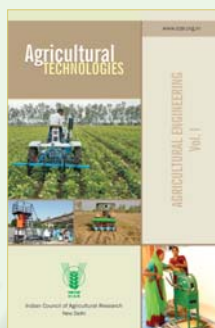
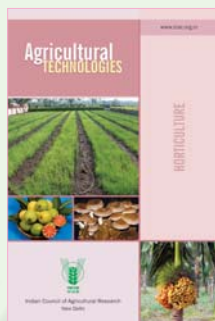


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# Agricultural TECHNOLOGIES

## AGRICULTURAL ENGINEERING

### Vol. I



Indian Council of Agricultural Research  
New Delhi



# Agricultural Technologies Commercialized

AGRICULTURAL ENGINEERING

Vol. I



Indian Council of Agricultural Research  
New Delhi

Printed : January 2014

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FOOD PROCESSING INDUSTRIES  
GOVERNMENT OF INDIA


## Message



Indian agriculture has overcome several challenges in the past and achieved phenomenal success ensuring self-sufficiency in food production. The technologies generated within the National Agricultural Research system (NARS) have significantly contributed to the transformation of Indian agriculture and ushering Rainbow Revolution representing Green, White, Golden, Brown and Blue revolutions defining outstanding technology-led performance in foodgrain, milk, oilseeds and pulses, horticulture and fisheries sectors. Agriculture along with other primary sectors is a major source of strength for the Indian economy. However, burgeoning population, increasing demand for food, feed and fodder, decreasing land availability, natural resource degradation, decreasing factor productivity, climate change, slow growth in farm income and new global trade regulations have put new challenges threatening food, nutritional and livelihood security.

Technological interventions by the NARS have led to spectacular accomplishments relating to input use efficiency, climate resilience, mechanization and secondary agriculture leading to economic transformation. These coupled with the application of information and communication technology will play a critical role in our future endeavours to accelerate agricultural growth in the country. I am glad that the Subject Matter Divisions of Indian Council of Agricultural research (ICAR) have synthesized and compiled practical and useful technologies in this series of seven publications on Agricultural Technologies in a user-friendly mode. I am sure this information will be useful to farming user-friendly mode. I am sure this information will be useful to farming community, extension agencies, entrepreneurs and agro-industries in their efforts to make Indian agriculture economically viable and ecologically secure.

Krishi Bhavan  
New Delhi - 110001



(Sharad Pawar)



## Foreword

Agriculture is the corner-stone of Indian economy. About 70% of India's 1.27 billion population live in rural areas with small and marginal land holdings. India with a geographical area of over 328 million hectares is endowed with diversity of climate, soils and vegetation. This rich resource endowment is, however, threatened with ever increasing population, vagaries of nature and climate change. The National Agricultural Research System (NARS) comprising the Indian Council of Agricultural Research (ICAR), 55 State Agricultural Universities, five Deemed Universities, four Central Universities with agriculture faculty, one Central Agricultural University and 636 Krishi Vigyan Kendras have attained excellence in several frontier areas of agricultural sciences and technology contributing significantly towards the spectacular growth of Indian agriculture during past 60 years.

Initiatives by NARS in the country have led to notable accomplishments resulting in the socio-economic transformation of farmers. The agriculture sector is, however, witnessing radical changes and challenges both at national and global level. The emerging challenges and opportunities necessitate wider and faster adoption of the improved technologies by all the stakeholders right from production to consumption in a food chain. In an effort to achieve this, the divisions of crop science, horticulture, animal science, natural resources management, fisheries and agricultural engineering in the ICAR have compiled the technologies already commercialised and the technologies ready for commercialisation. This series of publications, brings out the salient features of the technologies with details on potential users and contact details of the developers for ready and easy access. It will be our endeavour to periodically update this Technology Series. I hope that this publication would be useful to the farming community, extension agencies, entrepreneurs and industry. I greatly appreciate the efforts put in by my colleagues in the Council, research institutes and State Agricultural Universities (SAUs) in bringing out this compilation.



(S. Ayyappan)

Secretary

Department of Agricultural Research & Education  
and

Director General

Indian Council of Agricultural Research  
New Delhi

January 2014  
New Delhi





## Preface

The agricultural engineering division of ICAR is primarily involved in the areas of farm mechanization, precision farming, energy in agriculture, post-harvest management and value addition of agricultural, livestock and aquatic produce. The technologies developed by the institutes and the AICRPs are disseminated to the stakeholders through various channels. Transfer of technology to the farmers and the entrepreneurs has always remained a challenge. Engineering interventions in agriculture have become imperative to improve productivity, reduce the cost of production and drudgery, and improve livelihood opportunities. Farm mechanization for timeliness of operations, precision farming for improved input use efficiency, processing technologies for value addition and reduction in post-harvest losses, conservation of natural resources and energy management are the core areas. Technologies have been developed and commercialized in these areas.

Over the years, the network of institutions have been strengthened, but it still cannot reach the vast majority of stakeholders. The Engineering Division of ICAR has compiled two publications in the form of compendium of “Agricultural Engineering Technologies – Commercialised” and “Agricultural Engineering Technologies – Ready for Commercialisation”. The publications have been subdivided into sections on Seed Bed Preparation, Equipment, Value-Added Products, Irrigation and Renewable Energy and Miscellaneous Technologies to easily locate the relevant technologies. The salient features, performance results, cost (the cost is indicative depending on the place and year of development) impact and benefits, address of manufacturers and the institute where it has been developed have been included for each technology. I am confident that this publication will be useful to all the stakeholders involved in agriculture including extension personnel and entrepreneurs. I appreciate the efforts put in by my colleagues Dr K K Singh, ADG (PG), Dr K K Singh ADG (Engg.) Dr S Ganesan, Dr Devinder Dhingra, Dr K P Singh, Dr K N Aggarwal, Dr Nilesh Gaikwad and Ms Monika Sharma in compilation of the document.



**Dr Rama Rao**  
National Director  
NAIP, ICAR, New Delhi



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### Cotton Stalk Puller

#### Salient features

- Manually operated by single person to uproot the cotton stalks.



#### Performance

- Effective field capacity : 0.025 ha/h

#### Cost

- Unit cost : ₹ 700

#### Impact and benefits

- Uprooting of cotton stalks requires less force due to firm grip of jaws and mechanical advantage of the lever arm.
- Reduction in drudgery in cotton stalk uprooting.

#### Manufacturer

- M/s Samad Engg Works  
Parbhani (Maharashtra)

---

#### Contact

Head  
Department of Farm Machinery and Power  
College of Agricultural Engineering  
Marathwada, Krishi Vidyapeeth, Parbhani 431402 (Maharashtra)

## Animal Drawn Tendua Iron Plough

### Salient features

- Tendua iron plough developed as substitute to traditional wooden plough of Chhattisgarh. A steel shovel is fixed at lower end of plough, which can be replaced after being worn out.



Dimension (l×w×h) : 23×7.5×620 mm

Weight with beam : 22.5 kg

### Performance

- Field capacity : 0.015 ha/h
- Draught : 634 N
- Power required : 0.38 kW

### Cost

- Unit cost : ₹ 2,000

### Impact and benefits

- Working life increases to 5 years compared to 2 years of traditional wooden plough and higher field capacity.
- Reduced cost of cultivation due to improvement in service life.

### Manufacturers

- M/s Batala Engineering Works  
Hirapur Road Sarvodaya Colony, Telibandha, Raipur (Chhattisgarh)  
Tel.: 0771-6065555 E-mail: batalaengg@gmail.com
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College of Agricultural Engineering  
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Tel.: 0771-2102575 Fax: 0771-2442131, 2442302

## Animal Drawn Improved Blade Harrow

### Salient features

- Blade harrow is used for shallow tillage, weed control and *in-situ* soil moisture retention. The blade width has been standardized as 600 mm for bullocks of Madhya Pradesh. One roller attachment has been provided for light pressing of top soil.

Blade size : 600 mm  
Weight : 65 kg



### Performance

- Draught : 60 kg
- Field capacity : 0.072 ha/h

### Cost

- Unit cost : ₹ 2,500
- Cost of operation : ₹ 365 /ha

### Impact and benefits

- Life of improved blade harrow is 5 years as compared to 2 years of traditional blade harrow. Due to proper matching of blade size as per draught ability of bullocks, it is possible to achieve a higher field capacity (0.072 ha/h) for improved blade harrow as compared to conventional blade harrow (0.059 ha/h). There is a saving in ₹ 92/ha for each operation of blade harrow.

### Manufacturers

- M/s Narayana Agril. Works  
Dewas Indore Road, Dewas (Madhya Pradesh)
- M/s Farm Tools Works  
PO - Khurai, Sagar (Madhya Pradesh)
- Prototype Production Centre  
Central Institute of Agricultural Engineering, Bhopal 462038 (Madhya Pradesh)

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E-mail: director@ciae.res.in

## Animal Drawn IGKV Biasi Plough

### Salient features

- Biasi is a traditional intercultural operation carried out in line sown/ broadcast rice in paddy fields under standing water. The tynes are made of MS flat and the desired curvature is given to the tynes by forging. A shoe type furrow opener is used.

Dimensions (l×w×h) : 800×500  
×850 mm

Ground clearance : 285 mm

No. of tynes : 3

Spacing of tynes : 200 mm



### Performance

- Field capacity : 0.11 ha/h
- Draught : 550-650 N

### Cost

- Unit cost : ₹ 4,500
- Cost of operation : ₹ 600 / ha

### Impact and benefits

- As compared to the traditional plough, there is 50% saving in time and cost of operation.
- Improvements in traditional technology, therefore, ease in adoption and higher social acceptance.

### Manufacturers

- M/s Batala Engineering Works  
Hirapur Road Sarvodaya Colony, Telibandha, Raipur (Chhattisgarh)  
Phone: 0771-6065555 Email: batalaengg@gmail.com
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E-mail: sjogdand2000@yahoo.com

## Wheeled Type Multipurpose Tool Carrier

### Salient features

- Consists of a rectangular shaped toolbar frame, pneumatic wheels with screw jack and beam. Operations possible with tool frame are ploughing, secondary tillage with cultivator, sowing, bed forming, and bund making. In addition it has a trailer attachment as well as provision for attaching water tank.



### Performance

- Field capacity : 0.05-0.32 ha/h with different attachments
- Draught : 280-710 N

### Cost

- Unit cost : ₹ 30,000
- Cost of operation : ₹ 170- 1,000/ha

### Impact and benefits

- The major advantages are 300-400% increased field capacity.

### Manufacturers

- M/s M.M. Engineering Works  
M. I.A. Near UCCI Office, Road No. 12, Plot No. G1-469B  
Udaipur 313 003 (Rajasthan)
- M/s Kalpana Enterprises  
NB Complex, Plot No. 48, Near Pratap Nagar Thane ke pass  
Udaipur 313 001 (Rajasthan)
- M/s Jain Engineering Works  
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## Tractor Operated Peg Type Puddler

### Salient features

- The puddler is operated in 50-100 mm of standing water and produces a good puddle.

Dimension (l×w×h) : 2,000×630×  
680 mm

Weight : 90 kg



### Performance

- Field capacity : 0.40 ha/h

### Cost

- Unit cost : ₹ 9,000
- Cost of operation : ₹ 800-1,000/ha

### Impact and benefits

- It saves two passes and ₹ 2,200/ha. It can cover 12 ha more command area in a season of 100 h of use. The economic benefit per unit per season is ₹ 26,000.
- Reduces drudgery and allows timeliness of operation.

### Manufacturers

- M/s Mahindra and Mahindra Ltd.  
FES Tractor Division, Akurli Road, Kandivli East,  
Mumbai 400 101 (Maharashtra)  
Tel.: 022-66483630, 66483682  
E-mail: shirvaikar.rajeev@mahindra.com; bhade.madhav@mahindra.com

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Tel.: 0755-2521001, 2737191, Fax: 0755-2734016  
E-mail: director@ciae.res.in

## Tractor Operated Post Hole Digger

### Salient features

- Consists of an auger driven through tractor power take off for plantation of horticultural and forestry crop. The size of auger defines the size of pit formed. The augers of size 450 -600 mm diameter and 900 mm working length are commonly used.



### Performance

- Capacity : 40-50 pits/h

### Cost

- Unit cost : ₹ 60,000
- Cost of operation : ₹ 450/h

### Impact and benefits

- Easy to operate with higher output capacity besides timeliness of operation, and considerable saving of manual labour, time and money.

### Manufacturers

- M/s Jhandeana Industries  
C-70, Focal Point, G.T. Road, Moga 142 001 (Punjab)  
Phone: 01636-228511 Email: jhandeanac\_70@yahoo.co.in
- M/s Rattan Agro Industries  
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E-mail: fim@ciae.res.in; director@ciae.res.in

### CRRRI Manual Drum Seeder

#### Salient features

- Suitable for seeding of rice in puddled soil.

Dimension	:	1,800×1,540× 1,320 mm
Row spacing	:	150-200 mm
Hill spacing	:	100-150 mm
Seed rate	:	60-80 kg/ha
Weight	:	10 kg



#### Performance

- Field capacity : 0.057 ha/h

#### Cost

- Unit cost : ₹ 5,500
- Cost of operation : ₹ 800/ha

#### Impact and benefits

- The weeding of drum-seeded rice field can be easily done using paddy weeder.
- Net manpower saving of 148 man-hours/ha and 70% time.
- Reduces drudgery of the rice cultivators.

#### Manufacturers

- M/s Sidheswar Engineering  
Bidhyadharpur, P.O. Naya Bazar, Cuttack 753004 (Odisha)  
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# CRR I Manual Rice Transplanter

## Salient features

- A manually operated implement suitable for transplanting of rice seedling in puddled soil.

Type of seedling : Mat type  
Tray size : 480×220×  
15 mm



## Performance

- Field capacity : 0.02 ha/h

## Cost

- Unit cost : ₹ 7,000
- Cost of operation : ₹ 2,416/ha

## Impact and benefits

- Reduces drudgery
- Avoid bending posture of farm women for longer duration

## Manufacturers

- M/s Sidheswar Engineering  
Bidhyadharpur, P.O. Naya Bazar, Cuttack 753004 (Odisha)  
Mobile: 09937413942 Email: banshidhar.ojha@gmail.com
- Odisha Farm Machinery Research and Development Centre (OFMRDC)  
Satyanagar, Bhubaneswar 751007 (Odisha)  
Tel.: 0674-2572710 E-mail: ofmrhc.dag@nic.in

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## Contact

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Central Rice Research Institute  
Cuttack 753006 (Odisha)  
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## CRRRI Two-Row Manual Seed Drill

### Salient features

- It is useful for line sowing of rice for wet and dry soil condition. It saves seed and labour.

No. of rows	:	2
Row spacing	:	200 mm



### Performance

- Field capacity : 0.05 ha/h

### Cost

- Unit cost : ₹ 1,500
- Cost of operation : ₹ 950/ha
- Payback period : less than a year

### Impact and benefits

- The ease in weeding operation, using paddy weeder, in line sown paddy field.
- Saving in time and manpower.
- Ease in adaptation owing to less weight.
- It reduces drudgery of farmers in seeding and weeding operation.

### Manufacturers

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