



E-COFFEE TABLE BOOK

ON

WOMEN FRIENDLY TOOLS & EQUIPMENT

**All India Coordinated Research Project
on
Ergonomics and Safety in Agriculture**

**ICAR- Central Institute of Agricultural Engineering
Nabi Bagh, Berasia Road, Bhopal-462038.**

**Dr K. Alagusundram,
Deputy Director General (Engg.),
Indian Council of Agricultural Research, New Delhi.**



Agriculture involves various on-farm and off-farm activities which are drudgery prone. Human power in agriculture is employed as an important source of power. Agriculture sector in Indian employs 263 million human workforce. Of these, 97 million or nearly 40% are women. Women participation in agriculture is increasing due to shifting of male workers to urban areas for working in other non-agricultural activities to get better livelihood.

Women participate in various crop production and processing activities. Many a times the tools and equipments are developed keeping male workers in mind and they are very difficult for the women workers to operate. Due to this mismatch the drudgery of women increases manifold, results in low output and many a times leads to accidents and injuries. A proper design based on ergonomical characteristics of women workers such as anthropometry and strength capabilities is important for a successful adoption of the developed tools and equipments.

The All India Coordinated Research Project on Ergonomics and Safety in Agriculture (AICRP on ESA) and its 12 cooperating centers have been developing women friendly equipments with a major focus on drudgery reduction and increasing work efficiency of workers. To address the issue of women workers the scheme has collected the anthropometric and strength data of male and women workers from fifteen states of the country. The scheme has formulated design guidelines for incorporating ergonomical principles in design to match the capabilities of women workers. The centers of the scheme have developed women friendly tools and equipment matching to their capabilities and safe in operation.

This e-coffee table book on women friendly tools and equipment is aimed at creating large scale awareness about these technologies for its promotion among various stakeholders. I compliment the team of scientists of AICRP on ESA to bring out this E-coffee table book and hope that information given herein will be helpful to various stakeholders.

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K. Alagusundram



PREFACE

Farm women play a significant role in Indian agriculture and their number, at present, is estimated at about 97 million. They are employed mostly in drudgery-prone activities which includes transplanting, weeding, harvesting, threshing, grain cleaning etc. The tools/equipment available have been primarily developed for male workers and given for use to women workers which resulted in lower system efficiency and occupational health hazards. The ergonomical characteristics of farm women are different from the men. Therefore, it is necessary to develop technologies suited to farm women considering their anthropometric and strength data. Also, the developed technologies need to be demonstrated, and users have to be given training for their proper use. The centres of AICRP on ESA located at ICAR-CIAE and State Agricultural Universities have taken a lead in this direction and evaluated/ refined/ developed 32 tools and equipment suitable for farm women.

This compilation includes information of these 30 tools and equipment useful for treatment of seed, fertilizer broadcasting, sowing, transplanting, weeding, interculture, harvesting, threshing, cleaning/grading, decortication, maize shelling, cotton stalk pulling, dehusking and fish processing etc. The compilation is aimed to create large scale awareness among the different stakeholders such as agricultural engineers, home scientists, extension functionaries, research planners and administrators in formulation of programmes related to farm women.

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**K.N. Agrawal
R.R. Potdar
N. Thakur**

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SEED TREATMENT DRUM



- **Equipment provides safety to worker as direct contact with chemicals is avoided.**
- **Uniform mixing of chemical with seed is done.**
- **It also avoids bending/squatting posture as done in traditional method of treating the seed.**
- **Cost-Rs. 2000/-**
- **Capacity-200 kg/h**

FERTILIZER BROADCASTER



- **No direct contact of fertilizer with hands and uniform application.**
- **About 6% saving of cardiac cost of worker per unit area.**
- **Cost - Rs. 2500/-**

FOUR ROW PADDY DRUM SEEDER



- **Uniform seeding in rows.**
- **Light in weight, hence can be easily operated.**
- **About 40 percent saving in seed rate and 60 per cent saving in cost and time when compared to transplanting method.**
- **Environment friendly technology as the crop duration and thereby greenhouse gas emission is reduced by 10-15 days.**
- **Cost- Rs.6000/-**

NAVEEN DIBBLER



- **Seed saving and avoids bending posture.**
- **About 13% saving in cardiac cost of workers per unit of output.**
- **Line sowing is done with the equipment that promotes use of mechanical weeders thereby reducing drudgery and cost during weeding operation.**
- **Cost- Rs. 700/-**

SEED DRILL



- **Output is 18 times than traditional practice.**
- **By the use of seed drill, bending posture which is generally adopted in traditional method can be avoided.**
- **Apart from 87% saving in cardiac cost of workers per unit of output.**
- **Seed saving is also achieved.**
- **Cost- Rs. 5,000 /-**

RICE TRANSPLANTER



- **Suitable for root washed type seeding.**
- **It avoids bending postures which is adopted in traditional method.**
- **Operating cost is 70.5% less as compared to traditional method.**
- **Work output 7.8 times more as compared to traditional method.**
- **Cost- Rs. 6,500/-**
- **Capacity- 300 m²/h.**

THREE ROW RICE TRANSPLANTER



- **Transplanting can be done in three rows simultaneously with the equipment.**
- **Line sowing helps in promoting the use of mechanical weeders thereby reducing drudgery and cost during weeding operation.**
- **Field capacity-170 m²/h at working speed of 1.7 km/h**
- **Cost- Rs. 8000/-**

CONO WEEDER



- **Weeding operation in wetlands.**
- **Bending posture is avoided thus reducing drudgery of workers in weeding operation in wetlands.**
- **Output is increased significantly.**
- **Capacity – 120 m² /h**
- **Cost - Rs. 1900/-**

TWIN WHEEL HOE



- **Cutting and uprooting of weeds in the field and it use when the weeds are small i.e. 1 to 3 cm height for better weeding performance.**
- **Bending posture is avoided thus reducing drudgery of workers in weeding operation in wetlands.**
- **About 43 % saving in cardiac cost of workers per unit of output.**
- **Output is increased significantly.**
- **Cost - Rs 800/-**
- **Capacity - 150 m²/h**

IMPROVED SICKLE



- **Cutting of crop stalk and serrated sickle does not require the sharpening of cutting edge frequently.**
- **About 15% saving in cardiac cost of workers per unit of output with improved sickle as compared to local sickle.**
- **It also provides safety to the workers due to its better construction.**
- **Cost - Rs. 60 /-**

FRUIT HARVESTER



- **Operation is made safer as the worker does not have to climb on the tree and the chances of injury are eliminated.**
- **Damage to the fruit is avoided.**
- **Mean working heart rate was 107 beats/min**
- **Light in weight.**
- **Cost - Rs. 350 /-**
- **Capacity- 425 fruits/h**

PEDAL OPERATED PADDY THRESHER

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- **It helps to reduce the drudgery involved in paddy threshing operation as bending posture is avoided and arms are not to be raised for above shoulder height as in case of traditional method i.e. beating on a platform/stone.**
- **Avoids bending/postures.**
- **Work output is increased.**
- **Cost - Rs. 5500/-**
- **Capacity - 35 kg/h**

COTTON STALK PULLER



- **The puller is used to lift the cotton stock off the ground.**
- **Bending posture is avoided thus reducing drudgery and chances of backache of workers in cotton stalk pulling operation.**
- **Output of the worker is increased.**
- **Cost - Rs. 1200/-**
- **Capacity - 46 m²/h**

SCISSOR TYPE TEA PLUCKER



- **Used for ensuring better health and safety with improved work efficiency and reduced drudgery of farm women workers, an ergo refined scissor type plucker.**
- **The output is 40 % higher when compared with conventional method of hand picking.**
- **Economic benefit - Rs. 1000/unit/year**
- **Capacity - 8.6 kg/h**
- **Unit cost - Rs. 750/-**

CARDAMOM HARVESTING KNIFE

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- **Improved knives are used to harvest large cardamom.**
- **The improved knife helps to reduce the force required in operation, to minimize accident chances, and to reduce the drudgery involved in the task.**
- **The Weight of the improved knife is very less and the blade material is EN 8 spring steel.**
- **Cost - Rs. 200/-**
- **Capacity - 16.2 kg/h**

COCONUT TREE CLIMBER

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Woman using coconut tree climber

- **Climbing tree and It also helps to protect the worker from occupation dermatitis.**
- **Work output with coconut tree climbing device is 50% higher than conventional method.**
- **Eliminates the high work stress, severe neck and back pain disorders caused in traditional method of climbing and harvesting.**
- **Capacity - 56 coconuts/h**
- **Unit cost - Rs. 3,500/-**

GROUNDNUT STRIPPER



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- It is suitable for stripping of groundnut pod from the harvested crop.
- Output is 350 kg of pods/day.
- About 79% saving in cardiac cost of workers per unit of output.
- Squatting posture is avoided which minimizes stress at knee. Also, the hitting of the elbow against the abdomen while stripping is eliminated.
- Cost - Rs. 2,500/-
- Capacity - 11 kg/h/women

GROUNDNUT DECORTICATOR (STANDING-TYPE)

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- **Its use to extract seed from groundnut pod without damaging seed.**
- **About 79% saving in cardiac cost of workers per unit of output with the groundnut decorticator as compared to traditional practice.**
- **The productivity of workers increased tremendously than traditional practice apart from safety of workers.**
- **Capacity - 40 kg/h**
- **Unit cost - Rs. 2,400/-**

GROUNDNUT DECORTICATOR (SITTING-TYPE)



- **About 79% saving in cardiac cost of workers per unit of output.**
- **The reduction of drudgery with the equipment per kg of pods decorticated is to the tune of 74 and 79% in case of standing and sitting type decorticator respectively.**
- **Cost - Rs. 2,400/-**
- **Capacity - 30 kg/h**
- **Force required - 47 N**

TUBULER MAIZE SHELLER



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- **Maize sheller helps in shelling the maize grain from dehusked cobs.**
- **About 15% saving in cardiac cost of workers per unit of output.**
- **The productivity of workers increased 1.6 times than traditional practice i.e. shelling with the help of sickle.**
- **The chances of injury to fingers are eliminated thus making the operation safer for workers.**
- **Cost - Rs. 60/-**
- **Capacity - 27 kg/h**

ROTARY MAIZE SHELLER



- **Output is very high and the equipment is suitable for farmers growing large quantity of maize.**
- **About 32% saving in cardiac cost of workers per unit of output.**
- **Reduce injury to fingers.**
- **Cost - Rs. 5,000/-**
- **Capacity - 73 kg/h**

DOUBLE SCREEN GRAIN CLEANER



- **Its used to removal of foreign and undesirable material from desired grains / products.**
- **Productivity of the worker increased more than four times as compared to traditional.**
- **About 63% saving in cardiac cost of worker per unit of output.**
- **Working heart rate 104 beats/min**
- **Cost - Rs. 5,700/-**
- **Capacity - 225 kg/h**

PADDY WINNOWER

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- **This machine can be easily operated as there no need of waiting for air flow as required in traditional cleaning.**
- **This machine can be operated under shade or in the workshop where grain cannot be damaged due to rain etc.**
- **Easily operated by women while seating on chair or stool.**
- **Capacity - 242 kg/h**
- **Capacity of hoper - 8 kg**
- **Cost - Rs. 6,000/-**

ARECANUT SCARIFIER



- **Its used to peels the outer shell of the arecanut superficially without making any damage to nut.**
- **Possibility of injuries hands totally eliminated.**
- **Reduced drudgery in peeling operation.**
- **Increased work output.**
- **Capacity - 490 nuts/h**
- **Cost - Rs. 7,500/-**

ROTARY ARECANUT DEHUSKER



- **Used for removal of outer shell of Areca nut.**
- **Possibility of injuries to fingers and palm totally eliminated.**
- **Increased work output.**
- **Saving in cost of dehusking operation.**
- **Capacity - 5 kg/h**
- **Cost - Rs. 1200/-**

PEDAL OPERATED ARECANUT DEHUSKER

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- **Reduced drudgery involved in dehusking operation.**
- **Increased work output.**
- **Saving in the cost of dehusking operation.**
- **Pedaling rate - 60 rpm**
- **Capacity - 15 kg/h**
- **Unit cost - Rs. 25000/-**

CASHEW NUT DESHELLER



- **Drudgery involved in deshelling operation is reduced.**
- **Injuries to hands and other body parts due to cashewnut shell liquid oil is avoided.**
- **Cost - Rs. 4000/-**
- **Capacity- 5.3 kg/h**

HARVESTING BAG FOR WOMEN WORKERS



- **Bag used for harvesting and collection of the fruits and vegetables.**
- **Reduces the drudgery caused due to bending and squatting posture.**
- **Cost - Rs. 300/-**

POWER OPERATED GROUNDNUT STRIPPER CUM DECORTICATOR



- The equipment can be used only for stripping or decortication purpose. It has got a cylinder which has pegs as in case of stripper and shoe for decortication purpose.
- Average output capacity - 12.12 kg/h

FISH DRESSING PLATFORM

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- **Fish dressing platform used to dressing fish (removal of head, fins and tail part)**
- **Reduced the major problems in fish dressing operation i.e leg pain, back pain performed in squatting posture.**
- **Worker's work capacity increased with developed fish dressing platforms.**
- **Cost - Rs. 14750/-**

Compiled and edited by

K.N. Agrawal

R.R. Potdar

N. Thakur

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Director,

**ICAR- Central Institute of Agricultural Engineering,
Nabi bagh, Berasia Road, Bhopal-462038 (MP), India.**

Tel. No.: 0755-2521117, 2730983; Fax: 0755-2734016;

Email: directorciae@gmail.com, Website: www.ciae.nic.in

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