Technical Bulletin-4

IMPROVED AGRICULTURAL TOOLS/TECHNOLOGIES TO REDUCE DRUDGERY OF FARM WOMEN

ALL INDIA COORDINATED RESEARCH PROJECT
(AICRP)
ON HOME SCIENCE

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Preface

Women make essential contributions to the agricultural and rural economies in all developing countries. The women are backbone of agriculture workforce and are a vital part of Indian economy. Over the years, there is a gradual realization of the key role of women in agricultural development and their contribution in the field of agriculture and other allied sectors. Modernization of agriculture is taking place at a faster pace; however, jobs attended by women remain more or less the same. The moment a machine is introduced for a field operation; it is taken over by male workers. Though, considerable work has been done to develop agriculture with major emphasis on technical and economic achievement, very little attention has been given to gender issues. With this backdrop, All India Coordinated Research Project on Home Science, PAU had tested and refined the available agricultural implements in women perspective and also developed the need based technologies. Over the years, All India Coordinated Research Project, PAU, has developed/modified/tested fourteen technologies to address drudgery at farm and home. This publication on Technologies for Women in Agriculture is a compilation of vital information pertaining to those technologies.

I convey my appreciation to research team of the discipline of Family Resource Management who has contributed for their achievements in developing/modifying/testing the technologies.

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Contents

Hand operated Sapling Transplanter
(Tested)

Useful Features:

- Light in weight
- Easy to use
- Transplanting can be done upto the desired depth
- Eliminates standing-cum-bending / squatting posture
- It can be used by both women and men
- Saves time and human energy as compared to traditional method of transplanting.
- Reduces fatigue and incidence of musculoskeletal problems
- Reduces the physiological and muscular stress of the worker.

Technical description:

- Weight:
- Length of the pipe: 74 cm
- Circumference: 7 cm
- Material used: Stainless steel pipe

Impact on Ergonomic Cost:

Ergonomi Parameters	% Reduction in Ergonomic Cost over existing method
Heart rate (b/min)	10.88
Energy expenditure (Kj/min)	19.61
Total cardiac cost of work (beats)	25.15
Physiological cost of work (b/min)	37.29

Sapling carry basket
(Designed and developed)

Useful Features:

- Light weight

- Designed to carry the vegetable or flower saplings efficiently.
- Protects the saplings from injuries/loss.
- Adjustable straps wrap uniformly and are evenly distributed over shoulders and waist to fit any user
- Reduces the frequency of bending and picking saplings.
- Saves time and reduce drudgery.

Technical description:

- Material used: Light weight plastic
- Adjustable straps over shoulders and waist.

Impact on Ergonomic Cost:

Ergonomic Parameters	% Reduction in Ergonomic Cost over existing method
Heart rate (b/min)	4.89
Energy expenditure (Kj/min)	5.22
Total cardiac cost of work (beats)	22.50
Physiological cost of work (b/min)	12.00
Bending and standing up posture	100

***Increase in Work Output: 15%**

Grain Picker
(Tested)

Useful Features:

- Light in weight
- A rope/string covered with rubber material aid in better gripping of the tool and picking of grains comfortably.
- Helps in picking more quantity of grain per lift and performing

more lifts per minute, thus increasing work output in less time.

Technical description:

Length: 360mm

Width: 260mm

Depth: 110mm

Material: Aluminium

Impact on Ergonomic Cost:

ErgonomiParameters	% Reduction in Ergonomic Cost over existing tool
Grip fatigue of left hand	25.70
Grip fatigue of right hand	34.24

***Increase in Work Output: 16.67%**

Flower Harvesting Bag
(Designed and Developed)

Useful Features:

- Designed to carry out the flower plucking activity efficiently.
- Adjustable straps wrap uniformly and are evenly distributed over shoulders and waist.
- Shaped pocket in the front which makes the bag friendlier and reduces drudgery while putting flowers in the bag.
- Protects the flowers from injuries/loss.
- Saves time and reduce drudgery.

Technical description:

- Material used: water proof parachute material
- Length: 25"
- Width: 21"

- Width of pocket: 17"
- Circumference of pocket: 25"

Impact on Ergonomic Cost:

Ergonomic Parameters	% Reduction in Ergonomic Cost over existing tool
Heart rate (b/min)	8.89
Energy expenditure (Kj/min)	12.22
Total cardiac cost of work (beats)	32.50
Physiological cost of work (b/min)	16.00
Grip fatigue	22.00

***Increase in Work Output: 15%**

Ring cutter
(Modified)

Useful Features:

- Light in weight and convenient to use.
- Highly efficient for sharp and smooth cutting.
- Can be put to any finger making the hand free for holding more vegetables.
- Less risk of injuries.
- Low cost
- Designed for plucking of vegetables especially Ghia, Tori and Tar.

Technical description:

- Diameter: 2 cm
- Length of blade: 2.5 inches
- Material used: high carbon steel blade with aluminum ring

Impact on Ergonomic Cost:

Ergonomic Parameters	% Reduction in Ergonomic Cost over existing tool
Heart rate (b/min)	9.83
Energy expenditure (Kj/min)	1.90
Total cardiac cost of work (beats)	22.50
Physiological cost of work (b/min)	20.00
Grip fatigue	5.20

***Increase in work output: 20%**

Cotton Boll Plucker
(Modified)

Useful Features:

- Made up of light weight aluminium.
- Easy to pluck the cotton bolls.
- Plucker is cost effective.
- Use of plucker eliminates the scratches, cuts & injuries on fingers while plucking.

Technical description:

- Weight: 200 gm.
- Material used: aluminum

Impact on Ergonomic Cost:

Ergonomic Parameters	% Reduction in Ergonomic Cost over existing tool
Heart rate (b/min)	10.83
Energy expenditure (Kj/min)	3.80
Total cardiac cost of work (beats)	25.50
Physiological cost of work (b/min)	25.00
Grip fatigue	6.70

***Increase in Work Output: 17%**

Improved Sickle

(Modified and Tested)

Useful Features:

- Improved sickle have long serrated blade, which follow the friction and sheer principle to cut the plant with less force.
- Handles of the improved sickles are ergonomically designed to reduce stress on the grip muscles while cutting fodder and to ensure the safety against arms and hands injuries.
- Sharpness of the serrated blade is long lasting.

Technical description:

- Weight: 217 gms
- Total length: 41.5 cms.
- Material used: high carbon steel blade with wooden/plastic handle

Impact on Ergonomic Cost:

Ergonomic Parameters	% Reduction in Ergonomic Cost over existing tool
Heart rate (b/min)	3.30
Energy expenditure (Kj/min)	0.23
Total cardiac cost of work (beats)	263.50
Physiological cost of work (b/min)	8.80
Rated perceived exertion	0.70
Grip fatigue	48.68

***Increase in work efficiency: 3.20%**

Potato Picker
(Developed)

Useful Features:

- Made of light weight iron with handle grip.
- Can hold 10-12 potatoes at one time.
- Convenient handle height to keep the women in comfortable standing posture.
- Designed to avoid falling and damaging of potatoes while picking.
- Minimizes the stress on muscles of back and legs.
- Easily made by local artisans at low cost.

Technical description:

- Weight : 1 kg
- Weight: 4 ft.
- Jaw width: 10.5 inches (Provided with handle grip)
- Material used: Iron (MS), PVC Grip

Impact on Ergonomic Cost:

Ergonomic Parameters	% Reduction in Ergonomic Cost over existing tool
Heart rate (b/min)	8.73
Energy expenditure (Kj/min)	15.38
Total cardiac cost of work (beats)	42.99
Physiological cost of work (b/min)	11.45
Rated perceived exertion	1.00
Grip fatigue	21.60
Angle of deviation of spine from normal	83.35

***Increase in Work Output: 70%**

Fodder collector
(Developed)

Useful Features:

- Fodder collector is made as per the requirement of rural women.
- The weight of the fodder collector is light and easy to hold.
- The jaws of the collector are curved in a way so that they can collect the maximum load in one effort.
- The height of the handle is long enough to keep the women in comfortable standing posture.
- The ergonomic assessment of the tool showed that the use of this tool significantly reduced the physiological and muscular stresses of the women users.

Technical description:

- Weight: 2.5 Kgs.
- Length of the handle: 2 ft. 8 inches
- Total length of the tool: 3 ft. 8 inches
- Material used : Iron (MS)

Impact on Ergonomic Cost:

Ergonomic Parameters	% Reduction in Ergonomic Cost over existing tool
Heart rate (b/min)	2.72
Energy expenditure (Kj/min)	5.88
Total cardiac cost of work (beats)	6.11
Physiological cost of work (b/min)	5.98
Grip fatigue	51.06
Angle of deviation of spine from normal	81

Revolving Pihri
(Developed)

Useful Features:

- Revolving pihri is designed as per the sitting height of the women.
- Provision of wheels make the movement easy without getting up time and again.
- Use of revolving pihri improves the work posture from squatting to sitting.
- It minimizes the musculoskeletal problems of the users while performing the activity.

Technical description:

- Height: 12 cms.
- Width: 34 cms.
- Material used: Iron Frame
- Wheel (Plastic): 4

Impact on Ergonomic Cost:

Ergonomic Parameters	% Reduction in Ergonomic Cost over existing tool
Heart rate (b/min)	13.08
Energy expenditure (Kj/min)	13.10
Total cardiac cost of work (beats)	13.51
Physiological cost of work (b/min)	13.51
Angle of deviation of spine from normal	88.77

Double Wheel Barrow (Trolley)
(Tested)

Useful Features:

- Eliminate the head load of women.
- As trolley can hold large amount of dung therefore reduces the

time and distance travelled for disposing off dung to the place of disposal.

- The provision of wheels reduces the push and pulls force.

Technical description:

- Capacity: 2.75 Cu. ft
- Material: Galvanized iron sheet

Impact on ergonomic cost:

Ergonomic Parameters	% Reduction in Ergonomic Cost over existing tool
Heart rate (b/min)	19.91
Energy expenditure (Kj/min)	19.94
Total cardiac cost of work (beats)	16.58
Physiological cost of work (b/min)	8.55
Angle of deviation of spine from normal	86.46

Dung collector
(Developed)

Useful features:

- The long handle dung collector is designed as per the shoulder height of the women.
- It helps to perform the activity in comfortable standing posture.

Technical description:

- Shape: semi circle
- Material used: wood
- Material of the handle: bamboo
- Length of the handle: 4'1"

Impact on Ergonomic Cost:

Ergonomic Parameters	% Reduction in Ergonomic Cost over existing tool
Heart rate (b/min)	6.89
Energy expenditure (Kj/min)	1.10
Total cardiac cost of work (beats)	533.54
Physiological cost of work (b/min)	6.61
Rated perceived exertion	2.00
Grip fatigue	9.68
Angle of deviation of spine from normal	86.44