POST HARVEST SCIENCE & TECHNOLOGY FOR VALUE ADDITION AND AGRO PROCESSING IN FRAGILE FARMIC ECO-SYSTEM

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Table: R&D Organizations in India Involved in Post Harvest Management, Agro-Processing and Value Addition.

S. No.	Broad groups of organizations	Number
1.	ICAR Institute	17
2.	CSIR Laboratories	04
3.	SAUs and their constituent units	18
4.	IITs	02
5.	NGOs	11
6.	Ad.hoc PHT schemes	50
7.	Institutions under MOFPI	Not known

(Source: Singh et al. 2007)

Table 1 Harvest and post harvest losses in crops

Crop/ Group	% losses
Cereals	>10
Pulses	>15
Oilseeds	>12
Tuber crops	>20
Spices and condiments	>12
Plantation crops	>12
Commercial crops	>10

Fostering the Post Harvest Processing Culture

If we realize with honesty we will have to accept that Post harvest processing is about 1.5 percent in India as against 30% post harvest processing in some countries.

Where is the bottle neck?

Critically examining the status, it may be identified and enunciated that progress in the development of post harvest technologies (based on sound scientific footings) is substantial but we could not inculcate the habit or culture of post harvest processing for value addition in farmers, horticulturists, marketers, small entrepreneur and enterprising houses. .

Various Groups of Partners in Agro Processing Venture

1. ***Roles of crop production programmes*:**
2. ***Roles of crop improvement programmes*:**
3. ***Roles of crop protection programmes*:**
4. ***Roles of metabolic changes and their technological modulation*:**
5. ***Roles of post harvest technologists*:**
6. ***Roles of the network of KVKs, PHT centers and NRCs Rajasthan Model*:**
7. ***Roles of marketing institutes*:**
8. ***Roles of GIAN*:**
9. ***Roles of CSIR Laboratories*:**
10. ***Roles of MOFPI-New Delhi***

Table 2 A : Improved post harvest equipments suitable for farmers

S. No.	Name of m/c	Suitability for crops	Capacity kg/h	Power KW	Cost	
					Machine (Rs)	Operational (Rs/q)
1.	Hand operated double screen for grains	All grains	150-225	Manual	2,000	5.30
2.	Pedal/power operated grain cleaner	All grains	330-800	Manual /0.36	8,500	7.50
3.	Fruits-vegetable grader	Potato, orange, apple, malta	1500-2500	1-2	30,000	3-4
4.	Flour separator	Wheat, gram, soyabean	80-120	0.75	22,000	14
5.	Tubular maize sheller	Maize	18-22	Manual	30	62
6.	Maize dehusker sheller	Maize	800	3.5	33,000	14
7.	Decorticator	G. nut, castor	60-70	Manual	900	18
8.	Decorticator	G. nut	300	1.5	16,000	16
9.	Grain pearler	Wheat, bajra, sorghum, pulses	100-300	3.5	20,000	16
10.	Dhal mill	Moong, urd, arhar	100	1.5	13,500	17
11.	Grain mill	Grains, Pulses, Spices	10-30	0.75	9,500	45-110
12.	Potato peeler	Potato	30-32	Manual	4,000	30
13.	Potato Slicer	Potato	30	Manual	4,500	35
14.	Flaking m/c	Soya, maize, jowar, gram	20	0.75	13,000	75
15.	Solar Dryer	All vegetable	3-5 kg/batch	Solar	6,000	66 Rs/h
16.	Pea sheller	Pea	50-60	0.20	15,000	6-7
17.	Chilli seed extraction m/c	Chilli	50-70	1.5-2	20,000	10-15

Table 2 B : Some other harvest/post harvest equipment

1. Vegetable washing machine	**2. Ginger washing machine**
3. Fruit harvest net	**4. Solar cabinet drier**
5. Tomato juice extractor	**6. Green chickpea sheller**
7. Garlic bulb breaker	**8. Tamarind sheeting machine**
9. Tamarind De-seeding machine	**10. Radial honey extractor**
11. Multi crop threshers	

Table : 3 Technologies at advance stage of testing and release at National level

- Low cost grain infestation detector
- Solar batch-in-bin drier
- Evaporative cooled storage structures for oranges
- Process for erogt-bajra separation
- Rotary screen grain pre-cleaner
- Low cost seed storage bins
- Mango grader
- Safe storage of soybean seeds
- Storage technologies for pulses
- Natural air ventilated onion storage structure
- Trolley-cum-batch type drier
- Solar heat treatment machine for seeds/ grain
- Infrared seed treater
- Magnetic treater for seed
- Sun drying of chillies on different floors
- Packaging for mango
- Solar drier-cum-green house
- Temporary crop covering devices
- Chittore store bin for safe storage of food grains
- Groundnut grader (power operated)
- Solar cabinet drier
- Sugarcane juice bottling process
- Groundnut stripper
- Tamarind kernel paste
- Pearler for coarse cereals
- Leaf grinder (to be adopted for mehandi)
- Oleoresin from ginger
- Puffing of coarse cereals
- Lime juice extractor
- Roofing tiles from soybean straw and cement
- Ginger and turmeric polisher
- Dehydrated pea processing technology
- Guava toffee

Table 4 : Additional income due to adoption of improved post harvest operations

S.No.	Crop	Post Harvest Operations	Additional income %
1	Fruits and vegetables	i. Cleaning, grading and sorting	25.0
		ii. Drying	30.0
		iii. Preservation	15.5
2	Spices	i. Milling	20.0
3	Maize	i. Dehusking & shelling	12.5
		ii. Cleaning	7.5
		iii. Storage	15.5
4	Wheat	i. Cleaning & grading	7.5
		ii. Storage	15.0
		iii. Milling	15.5
5	Paddy	i. Cleaning & grading	7.5
		ii. Storage	15.0
		iii. Puffing	15.0
		iv. Milling	15.0
6.	Pulses	i. Splitting	10.0
		ii. Dehusking	10.0
		iii. Besan making	18.5
7	Oil seeds	i. Milling	12.5

Table 5 : Network for agro processing, value addition and marketing

S. No.	Name of locational institute	Contact person	Telephone No.	Priority Crops	Nodal place, model APC
1.	ARS, PHT Centre, Durgapura, Jaipur	Officer Incharge (OI) PHT	0141-2724075	Seed spices Clusterbean, henna, aonla, pomegranate, ber and aloe	Model APC, Durgapura
2.	PHT Centre, CAZRI, Jodhpur	OI, PHT		Under utilized fruits and vegetables of arid zone.	Model APC, Jodhpur
3.	PHT centre, CTAE Udaipur	OI, PHT		Maize etc.	Model APC, Udaipur

APC= Agro Processing Centres

Table 6 : District level agro processing and value addition centres

S. No.	Name of locational institute	Contact person	Telephone No.	Priority crops	District APC
1.	KVK, Tabiji, Ajmer	Chief Scientist (CS/OI)	0145-2440023	Seed spices	DAPC
2.	KVK, Abusar, Jhunjhunu	CS/OI	01592-233420	Bajra, mustard, guar, moong, moth and wheat	DAPC
3.	KVK, Beechwal, Bikaner	CS/OI	0151-2250944	Bajra, moth and datepalm	DAPC
4.	KVK. Dholpur	CS/OI	05642-240457	Mustard and chickpea, Bajra	DAPC
5.	KVK, Fatehpur-Shekhawati	CS/OI	01571-222062	Bajra and guar	DAPC
6.	KVK, Dausa	CS/OI	01427-231083	Wheat, bajra, moong, groundnut and mango	DAPC
7.	KVK, Jaisalmer	CS/OI	02992-251359	Bajra and guar	DAPC
8.	KVK, Sawai Madhopur	CS/OI	07462-220870	Mustard, chickpea and guava	DAPC
9.	KVK, Keshwana, Jalore	CS/OI	02973-265648	Seed spices	DAPC
10.	KVK, Kumher, Bharatpur	CS/OI	05644-240691	Mustard, chickpea and bajra	DAPC
11.	KVK, Hindaun, Karauli	CS/OI	Not installed	Mustard, chickpea, bajra and wheat	DAPC
12.	KVK, Nagaur	CS/OI	01582-240902	Bajra and Seed spices	DAPC
13.	KVK, Navgaon, Alwar	CS/OI	01468-275276	Mustard and chickpea	DAPC
14.	KVK, Sriganganagar	CS/OI	0154-2440352	Cotton, kinnou, wheat and barley	DAPC
15.	KVK, Banswara	CS/OI	242771	Mango, orange, maize, rice, wheat and vegetables	DAPC

contd. ...

contd. ...

S. No.	Name of locational institute	Contact person	Telephone No.	Priority crops	District APC
16.	KVK, Bhilwara	CS/OI	243850	Maize, wheat, moong and papaya	DAPC
17.	KVK, Bundi	CS/OI	2457815	Soyabean, guava and rice	DAPC
18.	KVK, Chittorgarh	CS/OI	241248	Maize, opium, ashwagandha, mustard, vegetable and guava	DAPC
19.	KVK Jhalawar	CS/OI	230504	Orange, lemon and rice	DAPC
20.	KVK, Kota	CS/OI	2326726	Soyabean, rice and seed spices	DAPC
21.	KVK, Baran	CS/OI	244862	Soybean, rice and seed spices	DAPC
22.	KVK, Sirohi	CS/OI	220708	Seed spices and isabgol	DAPC
23.	KVK, Dungarpur	CS/OI	231381	Fruits and vegetables	DAPC
24.	KVK, Rajsamand	CS/OI	220626	Vegetables and opium	DAPC
25.	KVK, Chomu (NGO) Jaipur	CS/OI	01425-235133	Vegetables and fruits	DAPC
26.	KVK, Sardarshahar (NGO), Churu	CS/OI	01564-221624	Bajra, moth, chickpea and guar	DAPC
27.	KVK (NGO), Barmer	CS/OI	0982-222865	Bajra and guar	DAPC
28.	KVK (NGO) Sangaria, Hanumangarh	CS/OI	01499-222762	Cotton and wheat	DAPC
29.	KVK (NGO) Vanasthali, Tonk	CS/OI	01438-228333	Mustard, chcikpea and bajra	DAPC
30.	KVK, Badgaon, Udaipur	CS/OI	0294-2451313	Opium, maize, wheat, fruits and vegetables	DAPC
31.	KVK, (ICAR), Pali	CS/OI	03229-256771	Mehandi	DAPC
32.	KVK, (ICAR),	CS/OI Jodhpur	Not available	Arid and under utilized fruits, vegetables, pearl millet etc.	DAPC

CENTRES OF POST HARVEST TECHNOLOGY IN INDIA

FRUIT GRADER (PDKV, Akola)

Output capacity : 10-12 tonne per day

Power : 0.75 kW

Manpower : Four (one semiskilled & 3 unskilled)

Unit Cost : Rs 57 000

Status : Ready for commercialization

FRUIT GRADER
(PDKV, Akola)

Four pairs of PVC pipes with diverging gap between each pair from feed end to opposite end for grading oranges and other spherical fruits.

A chain and sprockets arrangement is provided at the feed end for pboth the pipes of each pair will rotate in opposite direction outwardly by 80 rpm.

The spacing between the two pipes of each pair can be varied. This facilitates the grading of spherical fruits of various sizes.

CUSHIONED OUTLET
The placement of the partitions can be adjusted in the grooves as per the requirement of particular grade.

FRUIT & VEGETABLE WASHING MACHINE (PAU, Ludhiana)

Output capacity : 100 - 600 kg/h

Unit Cost : Rs 25,000 -50,000

Speed : 1 - 60 rpm, Foreign matter removed: 3 - 30%
Washing efficiency : 90.2-95.5%

Status : Commercialized

FRUIT & VEGETABLE WASHING MACHINE
(PAU, Ludhiana)

Suitable for a wide range of fruits and vegetables (carrot, potato, raddish, turnip, ginger, okra, tomato, spinach, turnip, kinnow and pears) for mechanical washing

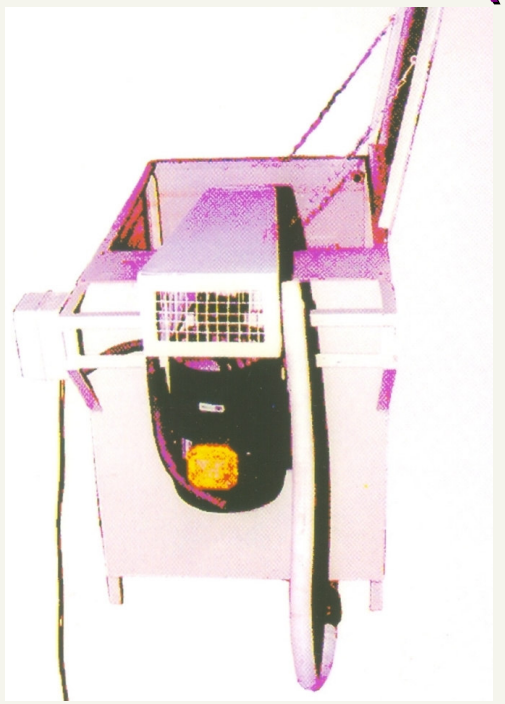
This portable, power operated vegetables washing machine has stainless steel inner rotary drum and a perforated outer casing.

Pressurized sprays of water with a water injection pump through the central, perforated inner shaft is provided for extensive washing, with proper arrangemnets for feed and drain water.

The machine is provided with a timer and an electronic device to regulate precisely the rotational speed of the drum.

MECHANICAL FRUIT WASHER

(RARS, Kolhapur)



Use : Suitable for on-farm grading

Output capacity : 325 kg/h

Unit Cost : Rs 5000

Status : Ready for commercialization

TOMATO SEED EXTRACTOR

(TNAU, Coimbatore)

Output capacity : 180 kg of fruit (1.8 kg of seed) per hour

Power :1 hp for electric motor and 0.5 hp for pump

Man power : Two persons

Unit Cost : Rs 15 000

Status : Commercialized (5 Licensees)

TOMATO SEED EXTRACTOR
(TNAU, Coimbatore)

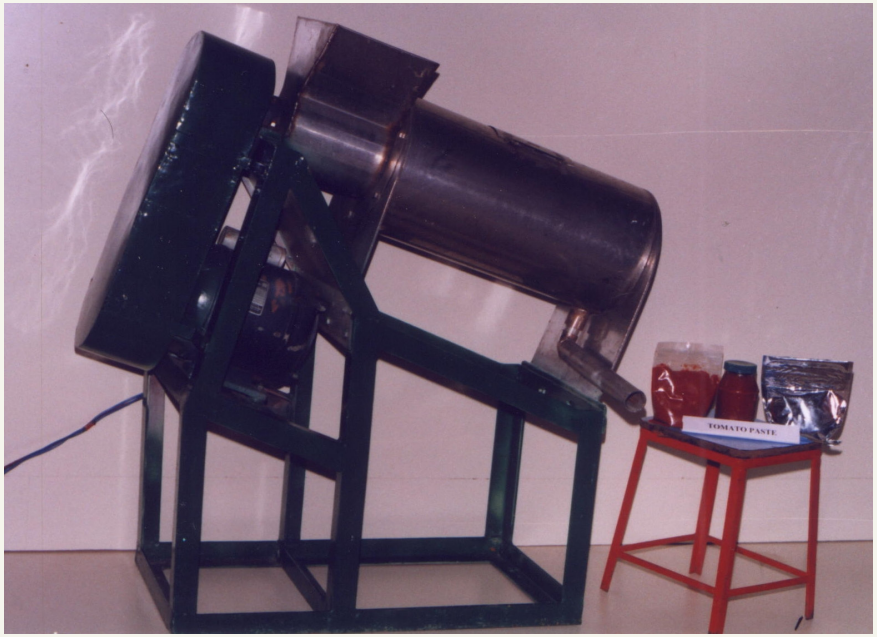
The unit consists of a feed hopper, fruit crushing chamber, seed separation unit, water recycling system and seed collecting trough.

In the crushing chamber the tomato fruits are crushed and squeezed by the rotating screw auger. In the seed separation unit, water separates the seed from the flesh and collected in a container placed at the bottom of seed separation unit.

The water collected in the trough is recycled by means of a pump.

TOMATO PASTE PRODUCTION

(TNAU, Coimbatore)



Machinery : Tomato Pulper, Steam Kettle, Glass bottles
Power : 1 hp
Man power : Two persons
Output capacity: 500 kg of fruit per day
Unit Cost : Rs.5,00,000 (depending on the size)

TOMATO PASTE
(TNAU, Coimbatore)

This technology aims at processing and preservation of glut season tomato for use during the off-season, by processing tomato into concentrate form.

Hybrid tomatoes, suitable for the production of tomato concentrate/ paste, are made into pulp in a pulper. The pulp is concentrated to paste (25° Brix) in an open steel vessel/ a steam kettle.

Sodium benzoate is added as preservative @ 250 ppm and packed for storage.

CHILLI SEED EXTRACTOR (PDKV, Akola)

Output capacity : 100-125 kg dry red chilli /hour

Power : 1.5 kW

Manpower :Two (one semiskilled and one unskilled)

Unit Cost : Rs. 38,500/-

Status : Commercialized

CHILLI SEED EXTRACTOR
(PDKV, Akola)

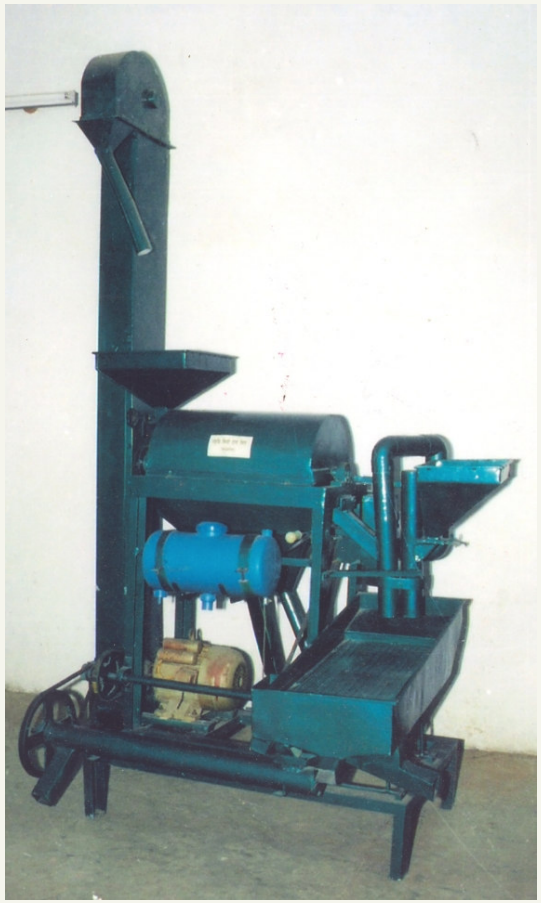
Presently the chilli seed, for raising seedling, is extracted by filling in bags and beating with wooden sticks. Tedious.Drudgery.
Continuous sneezing and body irritation of worker.

The recovery of seed from chilli fruits by this closed system chilli seed extractor is about 94-99% at 9-10% m.c. (wb), with no deterioration on seed germination.

Useful for seed processing plants, seed companies, etc.

MINI PULSE MILLS

PANTNAGAR
DHAL MILL



AKOLA
DHAL MILL

TNAU
DHAL MILL

PULSE MILLS : Comparative Analysis

	TNAU DHAL MILL	PANTNAGAR DHAL MILL	AKOLA DHAL MILL
Capacity, kg/h	20	100	100-125
Power, hp	1	2	3
Efficiency, %	80	70 - 80	82- 85
Unit Cost, Rs	10 000 /-	40 000 /-	70 000 /-
No. of Licensees	5	1	183

GARLIC BULB BREAKER

COST : Rs 11 000 /-

POWER : 0.5 hp

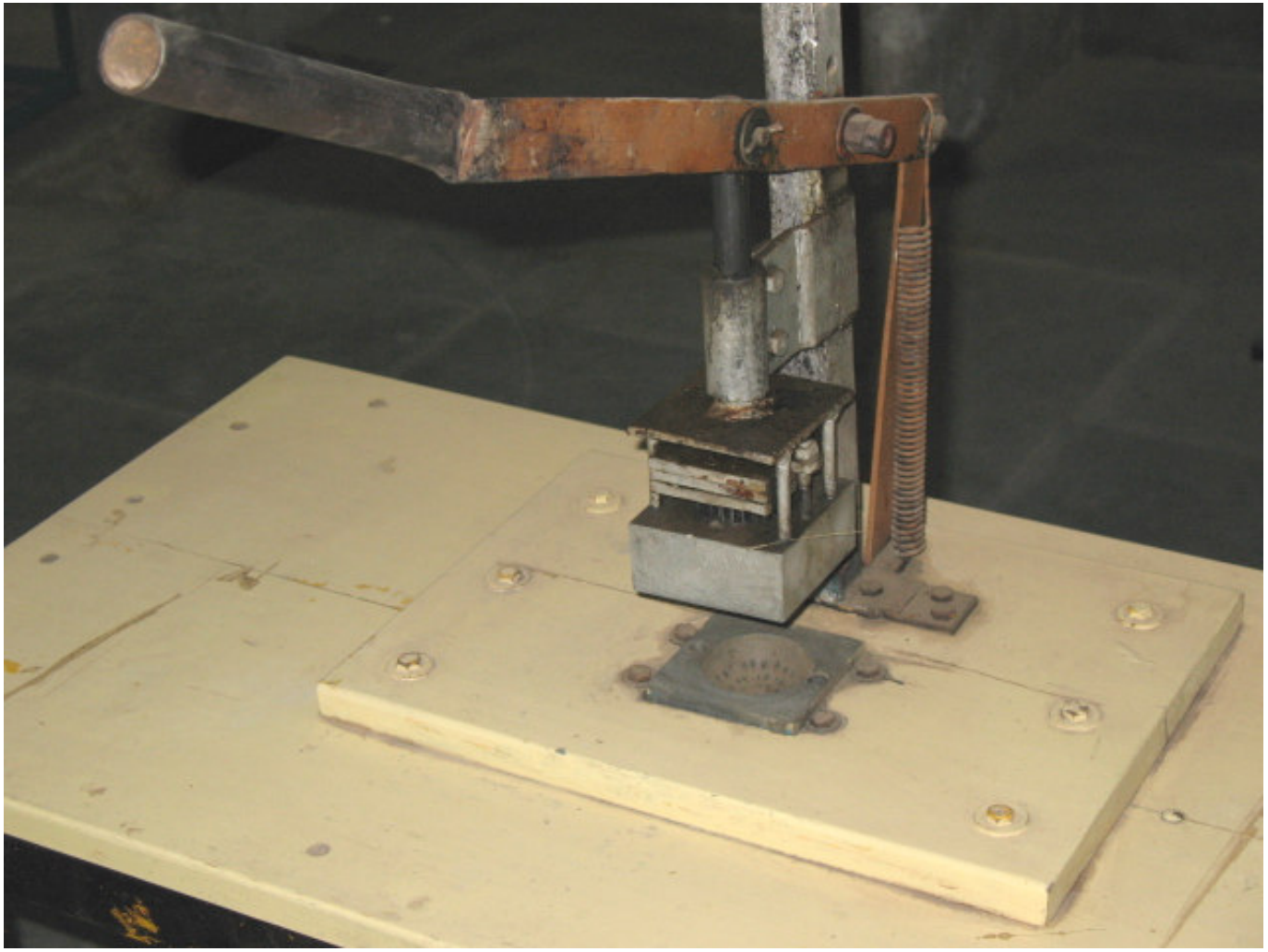
CAPACITY : 800 kg/h

GARLIC PEELER

Rs 70 000 /-

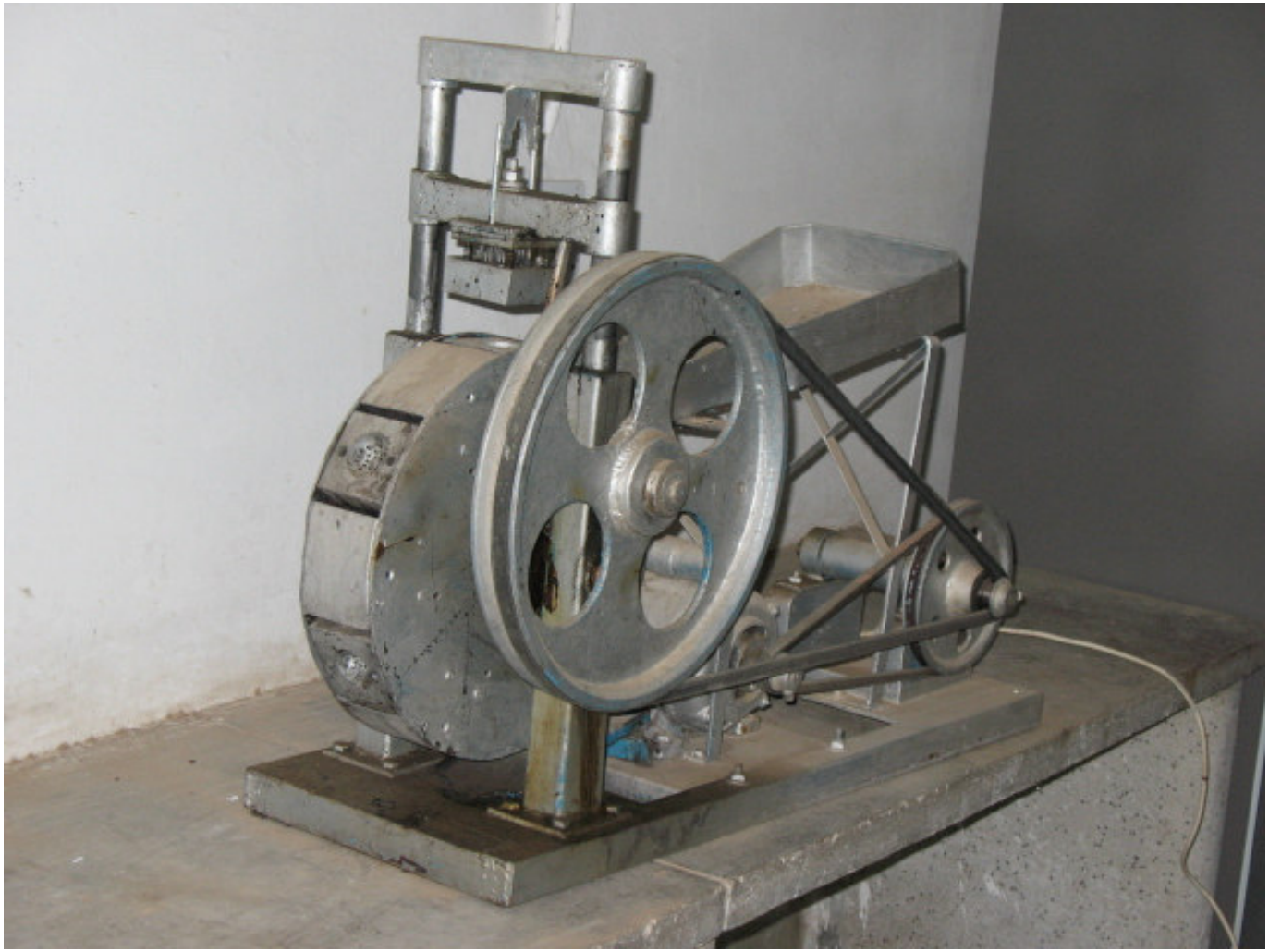
5 hp

40 - 50 kg/h



Aonla prickler (manual)

RAU, Model



Aonla prickler

RAU, Model

General Conclusions

GC 1

In view of enhanced food production, encouraged horticultural activities and alarmingly increasing population (India and some other countries), we have to accelerate our co-operative and concerted efforts in the sphere of food processing and other processed products development

GC 2

Swaminathan (2006) has rightly and strongly recommended to add the fruitful component of post harvest technology at each and every KVKs. And these KVKs in turn may act as extremely important locations for lab to land demonstrations in the areas of transfer of proven technologies on post harvest management, agro processing, value addition of primary products.

GC 3

AICRP on PHT centers will certainly perform a pivotal role in this endeavoural network.

For Further Details, Please Refer

Singh, Karan; Darmora, D.P.; Fageria, M.S.; Jain, N.K. and Gupta, M.L. 2007. Post harvest management and technology : Agroprocessing and value addition of medicinal and special plants. In muti-therapic Medicinal and Spiceal Plants, Vol 2. pp 3-39 (By). Karan Singh, M.L. Jakahr and D. Singh. Aavishkar Publishers, Distribution Jaipur, India-302003.


Thank
You