

## RESEARCH ARTICLE

**Pole Harvesting, A Viable Option for Harvesting of Oil Palm Fresh Fruit Bunches-A comparative study****M.V. Prasad<sup>1</sup>, S. Shivashankar<sup>2</sup>, N.V. Ganesh<sup>3</sup> and Ananta Sarkar<sup>4</sup>**

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**ABSTRACT**

*In oil palm, harvesting by climbing is the regular practice method and these climbing harvesters are facing several problems. The Pole Harvesting method was recommended by ICAR-IIOPR to overcome these climbing harvesting problems. A comparative study has been taken up between the climbing harvesting and pole harvesting and the results of this study were presented in this article. Results revealed that majority of the respondent pole harvesters (75%) and climbing harvesters (53%) belong to 25-30 age group. Majority of (66%) pole harvesters are having 1-4 years of harvesting experience, where in majority of climbing harvesters are having 5-8 years of harvesting experience. Majority of the pole harvesters (84%) working 4 or 5 hours per day, whereas the majority of climbing harvesters (47%) are engaged only for 4 hours. Pole harvesters (44%) are harvesting 3 tonnes of bunches per day, 47% of the climbing harvesters could harvest 2 tons per day. Majority of pole (41%) harvesters are engaged for 151-200 or 201-250 days in a year, majority (50%) climbing harvesters are engaged 151-200 days. Pole harvesters (81%) and climbing harvesters (78%) are earning wages Rs.700 per day. Pole harvesters perceived that they had Excellent, very good and good satisfaction of harvesting during rainy, winter and summer season respectively. Climbing harvesters perceived satisfactory, good and excellent satisfaction of harvesting during rainy, winter and summer season respectively. Pole harvesters (69%) and climbing harvesters (78%) had peak harvesting experience during July. Cent present of pole harvesters and climbing harvesters had perceived satisfaction of payment of wages on per day basis. Pole harvesters (97%) and climbing harvesters (62%) had perceived excellent wage payment. The problems associated with pole harvesting and climbing were recorded along with the suggestions received from harvesters.*

**Key words:** Harvesting; Oil palm; Pole harvesting; Climbing harvesting.

**O**il palm (*Elaeis guineensis* J.) originated in tropical rain forest of western Africa, is now being cultivated in more than 45 countries around the world especially tropical regions *i.e.*, Malaysia, Indonesia, Thailand, Nigeria, Columbia and Ghana. This perennial monocotyledon had been introduced to India during the second half of 20<sup>th</sup> century, because of its economic importance as major edible oil yielder per unit area. The pattern of edible oil consumption in India, mismatch between demand and supply of edible oil, substantial climatic conditions for Oil Palm cultivation therefore made its introduction to India towards attaining the sustainability in oil production and reduces the import of vegetable oils.

In oil palm, harvesting is considered as most challenging and laborious (43 to 45 per cent of total annual man days in productive life span of 9 to 25 years and expensive (16 to 18 per cent of total production cost) when compared to other practices (Evan and Gray, 1969; Awaludin *et al.*, 2015; Prasad *et al.*, 2015). Harvesting by climbing is the regular practice in vogue. Climbing harvesting is in practice in coconut and toddy palm. The climbing harvesters are facing several problems viz. skill frequency, working hour's frequency, insect bites, time consumption, season complications, physical strain etc. The Pole Harvesting method is introduced to overcome these climbing harvesting problems. The pole harvesters

are using single pole or telescopic pole with sickle for harvesting of oil palm fresh fruit bunches (FFB) while harvesting oil palm bunches from tall palms of more than 8 ft height (Shinoj 2004). The difference between pole harvesting and climbing need to be studied to find out suitable method of harvesting in oil palm. Most of Indian farmers are small and marginal with very meager knowledge of the technology necessitating



**Fig 1. Harvesting of oil palm fresh fruit bunches with climbing harvesting method**

parameters include harvesting experience data, working hour's frequency, oil palm FFB harvested, frequency of harvesting, harvesting charges, seasonal harvesting, convenient wages constraints and suggestions etc.

## **METHODOLOGY**

Respondents were selected from two village of Eluru district in Andhra Pradesh. Simple random sampling technique was adopted to select 32 respondents under each category of pole harvesting and climbing harvesting from two villages. A structured interview schedule was developed, pre tested and administered to the respondents. Appropriate statistical tools were used to measure the parameters. Statistical tools viz., T-test, Chi square test, frequency and percentage were calculated to quantify the responses and draw inference. Cost of harvesting using pole harvesting and

refocusing knowledge management (Chauhan *et al.*, 2015) and to reduce drudgery in farm operations (Singh *et al.*, 2018). Therefore, there is a need to develop effective technology delivery system to cater the need of the farmers (Adhikari *et al.*, 2021) with appropriate technology. Hence, a comparative study has been planned with the target to study the different parameters between pole harvesting and climbing harvesting. The



**Fig 2. Harvesting of oil palm fresh fruit bunches with pole harvesting method**

climbing were calculated using the collected data and with few assumptions. The pictorial view of climbing and pole harvesting methods are represented in fig1 and fig 2 respectively.

## **RESULTS AND DISCUSSION**

Majority of the respondent pole harvesters (75%) followed by climbing harvesters (53%) belong to 25-30 age group (Table 1). Mostly middle-aged harvesters are engaged in harvesting of bunches, because they are active and can bear body discomfort (Preethi *et al.*, 2018).

Pole harvesters are having high school education (41%) and belong to illiterate category, whereas climbing harvesters are illiterate (50%) (Table 1). Education would help in gaining knowledge on harvesting indices, process, and skill in efficient harvesting of bunches.

**Table 1. Categorization of respondents based on their socio-economic characteristics**

Socio-economic characteristics	Harvesting of bunches with pole (N=32)		Harvesting of bunches by climbing (N=32)	
	No.	%	No.	%
<i>Age (years)</i>				
≤ 24	03	9	--	--
25-30	24	75	17	53
31-36	05	16	08	25
37-41	--	--	03	9
42-46	--	--	04	13
Total	32	100	32	100
<i>Educational qualification</i>				
Illiterate	13	41	16	50
Primary school	02	6	10	31
High school	13	41	05	16
Intermediate	03	9	1	3
Degree / Others	01	3	--	--
Total	32	100	32	100
<i>Harvesting experience (yrs.)</i>				
1-4	21	66	06	19
5-8	05	16	19	59
≥ 9	06	18	07	22
Total	32	100	32	100
<i>Working hours per day</i>				
3	06	18	10	31
4	13	41	15	47
5	13	41	06	19
6	--	--	01	3
Total	32	100	32	100
<i>Oil palm bunches harvested per day</i>				
1	-	-	03	9
2	08	25	15	47
3	14	44	09	28
4	07	22	04	13
5	03	9	01	3
Total	32	100	32	100
<i>Number of harvesting days of employment per year</i>				
100-150				
151-200	13	41	16	50
201-250	13	41	14	44
251-300	06	18	02	6
Total	32	100	32	100

<i>Harvesting charges earned per day</i>				
600	01	3	01	3
700	26	81	25	78
≥800	05	16	06	19
Total	32	100	32	100
<i>Harvesting charges earned per acre per year</i>				
6000	01	14	01	50
7000	02	29	01	50
8000	03	43	--	--
9000	01	14	--	--
Total	7	100	2	100
<i>Satisfaction of number of harvests in season</i>				
<i>Rainy</i>				
1 (Satisfactory)	04	13	20	63
2 (Good)	02	6	05	16
3 (Very good)	03	9	02	6
4 (Excellent)	23	72	05	16
Total	32	100	32	100
<i>Winter</i>				
1 (Satisfactory)	02	6	02	6
2 (Good)	02	6	17	53
3 (Very good)	19	59	11	34
4 (Excellent)	09	28	02	6
Total	32	100	32	100
<i>Summer</i>				
1 (Satisfactory)	04	13	04	13
2 (Good)	15	47	06	19
3 (Very good)	10	31	08	25
4 (Excellent)	03	9	14	44
Total	32	100	32	100
<i>Peak month of harvest</i>				
June	6	19	5	16
July	22	69	25	78
August	4	12	2	6
Total	32	100	32	100
<i>Perception on payment of wages</i>				
Per day is satisfactory	32	100	32	100
Per acre/year satisfactory	--	--	--	--
Total	32	100	32	100
<i>Appropriateness of wages payment</i>				
Satisfactory	--	--	02	6
Good	--	--	05	16
Very good	01	3	05	16
Excellent	31	97	20	62
Total	32	100	32	100

Majority of (66%) pole harvesters are having 1-4 years of harvesting experience, where in climbing harvesters are having 5-8 years of harvesting experience (Table 1). Experience makes the harvesters in harvesting of ripened bunches and efficient harvesting.

Majority of the pole harvesters (84%) are working 4 or 5 hours per day, while climbing harvesters (47%)

are engaged for 4 hours (Table 1) only. Harvesting by climbing on palm tree involves frequent upward, downward movement and walk in the field, hence harvesters will have discomfort, hence working for 4 hours per day. Pole harvesters will have less discomfort (since they stand and walk on ground), hence they could do harvesting up to 5 hours per day.

Majority pole harvesters (44%) are harvesting 3 tonnes of oil palm bunches per day, where in 47 per cent of the climbing harvesters could harvest 2 tons per day (Table 1). Skilled pole harvesters require less slashing time to harvest oil palm FFB and underlying leaves (Preethi *et al.*, 2018), hence they could harvest a greater number of bunches in a day.

Majority of pole (41%) harvesters are engaged for 151-200 or 201-250 days in a year, while majority (50%) climbing harvesters are engaged 151-200 days (Table 1). Pole harvesters need not climb and embrace the trunk (for climbing up and come down), unlike climbers. Climbing harvesters expressed their difficulty of harvesting during rainy season and hot summer, hence they could be engaged less number of days compared to pole harvester.

Majority of pole harvesters (81%) and climbing harvesters (78%) are earning wages Rs.700 per day (Table 1). Harvesters preferred per day average wage of Rs. 700/-, when compared to previous wages per day Rs.500/- (Preethi *et al.*, 2018).

Few of the harvesters are earning harvesting charges on per acre basis, results (Table 1) revealed 43 per cent pole harvesters are earning Rs.8000/acre, where in climbing harvesters is earning Rs.6000 or Rs. 7000 per acre. Harvesters who are having nearby oil palm plantations and farmers who are offering regular employment for other farm works during non-harvesting days, (as per their choice) they are taking wages on per acre per year basis.

Majority of the pole harvesters perceived (Table 1), that they had Excellent, very good and good satisfaction of number of harvests during rainy, winter and summer season respectively. Whereas climbing harvesters perceived satisfactory, good and excellent satisfaction on number of harvests during rainy, winter and summer season respectively. Based on weather

conditions, pole harvesting method will have its own advantage over climbing harvesting. Climbing harvesters expressed their difficulty of harvesting during rainy season, hence expressed satisfaction. Pole harvesters will have congenial atmosphere in the morning hours (4 or 5 hours) for harvesting of bunches, hence majority of farmers felt excellent, with number of harvests in summer season.

Majority of the pole harvesters (69%) and climbing harvesters (78%) had peak harvesting experience during July month, followed by June and August (Table 1). This trend is coinciding with onset of monsoon and high rainfall period.

Cent percent of pole harvesters and climbing harvesters perceived (Table 1) satisfaction of wage payment on per day basis. This trend could be due to wage payment received on the same day of work completion. Majority of pole harvesters (97%) and climbing harvesters (62%) had perceived excellent over appropriateness of wage payment (Table 1). Harvesters felt that wage payment is appropriate for the work what they have done on per day basis, for 4-5 hours of work. The results revealed that harvesters are getting desired wage payment.

*Folded F statistics:* Results reveals that P value for Folded F statistics suggest that all variables except wages per day satisfy the assumption of equality of variances for the two harvesting styles (Table 2). Further analysis using t-test for comparing means of the two harvesting methods indicates that pole harvesting contributed for significantly higher FFB harvesting/day and significantly higher number of harvestings during rainy and winter season whereas climbing resulted in significantly higher number of harvestings during summer season at 5 per cent level of significance.

The response variable (adopted method of

**Table 2. Summary of tests for Equality of variance and t-tests**

Variable	Average		Folded F		Pooled		Satterthwaite	
	Climbing	Pole	F-value	P-value	t-value	P-value	t-value	P-value
Wages per acre	6500.00	7714.30	3.14	0.8137	-1.27	0.2441	-1.76	0.1710
Wages per day	731.30	714.10	3.99	0.0002	0.73	0.4701	0.73	0.4711
Employment	222.50	232.50	1.15	0.6982	-1.35	0.1810	-1.35	0.1810
FFB_harvested	2.53	3.16	1.07	0.8584	-2.67	0.0096	-2.67	0.0096
Rainy	1.75	3.41	1.12	0.7546	-5.99	<0.0001	-5.99	<0.0001
Summer	3.00	2.38	1.67	0.1568	2.60	0.0118	2.60	0.0119
Winter	2.38	3.06	1.32	0.4390	-3.87	0.0003	-3.87	0.0003
Working_hrs.	3.94	4.22	1.14	0.7217	-1.45	0.1522	-1.45	0.1522

**Table 3. Maximum Likelihood harvesting method**

Parameter	DF	Estimate	SE	Wald $\chi^2$	Pr > $\chi^2$
Intercept	1	7.5932	2.4412	9.6747	0.0019
Age	1	-0.2353	0.0810	8.4308	0.0037
Experience	1	-0.1062	0.0857	1.5351	0.2153

**Table 4. Problems faced in harvesting and suggestions**

<i>Harvesting of bunches with pole</i>
Problems in height gardens with snakes and electrical lines-should always be vigilant
Neck Pain in initial Stage of Harvesting
<i>Harvesting of bunches by Climbing</i>
No Safety
Lot of energy will be lost while climbing up and down
Leg injury is common
<i>Suggestions</i>
<i>Harvesting of bunches with pole</i>
Joints/Clamps Strength may be improved
Sickle Bending to be arrested
Weight Less Poles
Need Insurance
<i>Harvesting of bunches by Climbing</i>
Light weight sickle
Need Insurance

harvesting) is binary (1: climbing; 2: pole harvesting/improved technique). Binary logistic regression model was used to study the effect of age and experience on choosing the methods of harvesting FFB (Table 3). Result shows that younger farmers significantly adopted pole harvesting than climbing. This could be due to their enthusiasm to work hard and earn a greater number of days in year for their lively hood security.

Pole harvesters expressed problems viz., Problems in height gardens with snakes & electrical lines and Neck Pain in initial Stage of Harvesting (Table 4). While climbing harvesters expressed following problems viz., No Safety, Lot of energy will be lost while climbing up and down and Leg injury.

Results from Table 4, reveals that pole harvesters suggested Joints/Clamps strength may be improved, sickle bending need to be arrested, weight less poles may be supplied, they need insurance. The climbing harvesters had suggested for light weight sickle and insurance. Stakeholders must consider the above suggestions while employing the harvesters for harvesting of oil palm bunches.

### CONCLUSION

Comparing the two harvesting methods indicated that pole harvesting contributed for significantly higher

FFB harvesting/day and significantly higher number of harvests during rainy and winter season. whereas climbing resulted in significantly higher number of harvests during summer season. Result showed that younger farmers significantly adopted pole harvesting than climbing. Suggestions to overcome the constraints faced by harvesters need to be addressed by the stakeholders. Perception of harvesters on pole harvesting method was much appreciable than climbing method. Cost economics study conducted using the data collected from harvesters and results reveals that, an average a farmer can earn additional income of about Rs. 4950/- per year from 1 ha of land by practicing pole harvesting method over climbing method where as a harvester can earn about Rs. 99,000/- per year as additional income by practicing pole harvesting technology over climbing method.

### CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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