



Research Article

COMPARATIVE STUDY ON THE INTRODUCED SERRATED SICKLE WITH THAT OF DESI SICKLE USED BY TRIBAL WOMEN OF KOHIMA DISTRICT

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Abstract: Kohima is a tribal dominated hilly district of Nagaland. The tribesman grows paddy under rainfed condition in Jhum and Terrace fields. The woman contributes maximum time in operation and harvesting to be the most laborious activity. Sickle used by them found to be non-serrated, inferior and required more time to harvest. Observing the Lacuna serrated sickle of Laxmi and Vaibhav was introduced. A harvest area of 47 m²/hr (Laxmi) and 46 m²/hr (vaibhav) were obtained which was 8.91 and 6.5 percent more than the area harvested by desi sickle (43.2 m²/hr). The Man-hour (213) and labour requirement (26) per hectare in case of laxmi sickle was also reduced by 8.92 and 11.53 percent over desi sickle. Harvesting cost in the case with desi (₹10150), Laxmi (₹9217) and Vaibhav (₹9450) sickles also differed which can be reduced from 7.40 to 10.12 percent once replaced with serrated ones.

Keywords: Desi sickle, Introduced sickle, Serrated sickle, Tribal women

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Introduction

Paddy is one of the most important cereal crops and is extensively cultivated by the people world over. India is the largest cultivator of paddy in area and ranks 2nd in terms of production next to China. Tribal women contribute maximum time in agricultural crop production as Singh, (2012) [1] estimated that the overall contribution of women in farm production ranged from 55 to 65 percent of total labour with variation from region to region. Except for land preparation, burning of jungle and grain storage, most of the other operations –seed selection (55.3%), sowing/ nursery raising (55.26%), harvesting/plucking (72.9%) and threshing (72.63%) are done exclusively or predominantly by women [2]. Bhakta, et al., (2021) [3] emphasized that Timely harvesting ensures better yield, good quality of grains, consumer acceptance and less breakage when milled. The right stage for harvesting is when panicles turn golden yellow with grains containing about 20 percent moisture. Traditional tools and implements used for manual cultural operation often cause musculoskeletal disorders and occupational health risk. Mohan and Patel (1992) [4] reported that maximum injuries occurred with hand tools like spade (24%) and sickles (23%) while working. Oberoi and Singh (2001) [5] identified harvesting as one of the most drudgery prone tasks on calculated drudgery index (34). Harvesting is manually done using sickles, knives or mechanically harvested using rice reapers or combine harvesters. Sa'diyah et al., (2021) [6] emphasized that Harvesting makes peasant work in bad posture, which increases the risk of Work related Musculoskeletal Disorders (WMSDs) and physical workload.

Amponsah et al., (2021) [7] however, reported that manual sickle was found to be more efficient than other traditional tools (cutlass). Today tribal farmers rely on locally available desi sickle due to low purchasing power. Depending on its cutting-edge sickle are available in two types i.e., plain edge and serrated edge. The plain edge sickle performs on shearing force, while the serrated edge performs by frictional force. In Kohima district, tribal women use plane edge sickle for harvesting which starts early morning and continues till late evening, and sometimes carried over to the next day.

Patel and Singh, (2013) [8] recommended use of improved serrated sickle as it reduces drudgery of farm women, saves time, money and is more productive [9]. Sajeev et al., (2021) [10] highlighted that Krishi Vigyan Kendra' conduct a variety of training programmes for the benefits of farmers and youths in each district of the country. The present study analyses the introduction of new serrated sickle and suggest its usefulness and recommendation

Material and Methods

The study was conducted as Action Research Participatory Approach mode over a period of three years (2017-2019), covering villages like Mezoma, Kegwema, Phesema, Botza, Touphema, New Tesophenyu, Ziphenyu, Tesophenyu, Nsunyu and Sendenyu villages falling under four blocks of Kohima district. Tribal women numbering 150 belonging to small and marginal categories were identified in collaboration with the Farmers' Club of the villages. These Women were selected and identified based on their expertise from two or more villages each year which stood at 50 participants. The operations were carried out during the harvesting season in Jhum paddy as well as in Terrace Fields which starts from last part of September and continues till early part of December. Harvesting is usually done in different harvesting postures like standing erect, stooping and standing cum bending etc. Desi sickles used are locally made and have low quality iron/mild steel with plane edge, some had serrated sickles with worn out edges due to constant sharpening and use. By observing this lacuna of the tribal women which was never studied and recorded in Kohima district, the concept of introducing a women friendly improved serrated sickle such as Laxmi and Vaibhav were considered as these were of high-quality carbon steel, self-sharpening cutting edge and design to reduce stress. The sickles were handed over to the concern farmers one day in advance to familiarize with the tool by harvesting in certain plots before the real assessment. The introduced sickle was compared by measuring the area covered/hr, man-h requirement/ha and harvesting cost/ha. Each farmer was also made to share their feedback regarding the tool. The collected data were measured, analysed and interpreted in percentage.

Table-1 Performance of sickle under Field Demonstration

Year	Participants	Area covered m ² /hr			Man-h requirement/ha			Cost of harvesting/ha(₹)		
		Desi Sickle (T ₁)	Introduced sickle		Desi Sickle (T ₁)	Introduced sickle		Desi Sickle (T ₁)	Introduced sickle	
			Vaibhav(T ₂)	Laxmi(T ₃)		Vaibhav(T ₂)	Laxmi(T ₃)		Vaibhav(T ₂)	Laxmi(T ₃)
2017	50	42.6	46.3	47.3	235	216	211	10150	9450	9100
2018	50	41.8	44.5	45.9	239	225	218	10500	9800	9450
2019	50	45.2	47.4	47.9	221	211	209	9800	9100	9100
Mean	50	43.2	46.0	47.0	232	217	213	10150	9450	9217

Table-2 Attitude towards the sickle under study

SN	Particulars	No. Of positive responses		
		Desi (T ₁)	Vaibhav (T ₂)	Laxmi (T ₃)
1	Satisfaction with handle	45(30%)	40(26.67%)	65(43.34%)
2	Satisfaction with weight of sickle	40(26.67%)	60(40%)	50(33.34%)
3	Satisfaction with blade material	-	65(43.34 %)	85(56.67%)
4	Satisfaction with blade sharpness	15(10%)	55(36.67%)	80(53.34%)
5	Satisfaction with curvature of blade	35(23.34%)	60(40%)	55(36.67%)
6	Satisfaction with its durability and use	10(6.67%)	70(46.67%)	70(46.67%)
Weighted mean score		0.96	2.33	2.7
Ranked		III	II	I

Table-3 Analysis of Variance

Source of variation	Sum of square (SS)	Degree of freedom (DF)	Variance Estimate(S)	Variance ratio(F)
Between samples	4341.53	2	2170.76	12.451
Within samples	2440.78	14	174.34	

Table-4 Post hoc Test of Anova (Least Significant Difference)

	Desi (T ₁) \bar{X} 1= 29	Vaibhav (T ₂) \bar{X} 2= 58.33	Laxmi (T ₃) \bar{X} 3= 65.5
Desi (T ₁) \bar{X} 1= 29	-	29.33**	36.5***
Vaibhav (T ₂) \bar{X} 2= 58.33	-	-	7.17 NS
Laxmi (T ₃) \bar{X} 3= 65.5	-	-	-

Results and Discussion

Performance of sickle under demonstration

The introduced sickles and the desi sickle used for harvesting paddy were identified and tested for its performance on the same paddy field own by the farmer (here after will be called as subjects). The performance was carried out at different location over the years. However, for the present study the average data of last 3 years were taken into account. General observation during the assessment was that the average number of hills per cut was found to be 2 to 3, the number of strokes per min was observed to be 35.9 for desi sickle and 39.1 in case of improved sickle on average. The whole operation was carried out first starting with the desi sickle thereafter with the introduced ones.

The performance of the sickles was compared for its efficiency in the process of harvesting. It was observed [Table-1] that laxmi sickle covered bigger area of 47 meter per hour i.e., 8.91 percent more than the area cut by desi (43.2 m²/hr) sickles. Man-h required for harvesting one hectre paddy was highest in desi sickle (232 Nos) which had been reduced by 8.92 percent with respect to Laxmi (213 Nos) sickle. Estimation on harvesting cost also revealed that desi sickle (₹10,150) had the highest expenditure per hectre than that of vaibhav (₹9,450) and Laxmi (₹9,217) sickle. As more numbers of man-h is required for harvesting, the production cost is also escalated which is the case with desi sickle. Large horizontal dissemination of the newly introduced sickles can reduce harvesting cost from 7.40 to 10.12 percent on average. Similar findings were also reported by Kumar and Kumari (2018) [11] on the newly refined Bokaro sickle which saved 26 percent each in man-h requirement, labour and cost of harvesting per ha when compared to locale sickle. The assessment made during the year 2019 was observed to have performed better over the mean average in terms of area coverage, reduction in man-h requirement, and also the cost of harvesting. It could be due to the fact that the sickle being women friendly, easy to handle and something which they wanted to own.

Attitude towards the sickle

The analysis of the subject towards the introduced tool was performed after harvest. The subjects were made to reply on the special features of all the three sickles experienced during its operation throughout the assessment period over

the years. They were asked to give their opinion by selecting the best tool among the three. Their attitude towards the sickle is provided in [Table-2]. As per feedback received it was found that the subjects were satisfied with the wooden handle of Laxmi sickle (43.34%) followed by deshi (30%) and vaibhav (26.67%) respectively. However, with respect to the weight of sickle it was found that more responded in favour of vaibhav(60). It was also assessed that Laxmi sickle had maximum satisfactory responses with the material of blade used (56.67%) and blade sharpness (53.34%). In response to the curvature of sickle it was found that 40% of the subjects were satisfied with vaibhav sickle whereas it was 36.67% in favour of Laxmi sickle. The subjects also suggested in reducing the curvature of Laxmi sickle to make it more durable and handier as it sometimes causes injury while handling. Singh (2012) [12] suggested that improved sickle having similar concavity blade as that of local sickle could be manufactured and popularized among farm workers. On durability and use of sickles it found that both Laxmi and Vaibhav sickle scored equally (70) over the deshi sickle (10). Tiwari *et al.* (2020) [13] studied 12 different traditional sickle and observed that blade geometry contributed significantly in its comfort and safety and therefore incorporated to optimized the blade geometry and handle in new design. Nine different sickles were analysed for its design features and concluded that the blade geometry contributes significantly to human performance [14]. Similar findings were also reported, regarding modification of tools for better performance for tribal women [15].

The findings from these comparative analysis and attitude towards the sickles, revealed that maximum satisfactory responses were in favour of Laxmi sickle followed by vaibhav and deshi sickle respectively in the district of Kohima. In order, to validate the responses a test on analysis of variance was done between and within the samples with Hypothesis as:

Ho : Performance of the three sickles does not show significant difference.

i.e., T₁=T₂=T₃

The test result [Table-3] obtained shows that the calculated value of F=12.451 to be more than the Table value F(3,74) at 5% level of significance, Hence, our Null Hypothesis is rejected and conclude that the performance of the three sickles show significant difference. To further know which of the three sickles is more significantly different from the other.

A Post hoc Test of Anova is considered as shown in [Table-4]. It revealed that the parameter mean of the sickle is very highly significantly different between Desi (T_1) and Laxmi (T_3) sickles ($P < 0.001$) and highly significant between samples of Desi (T_1) and Vaibhav (T_2) sickles ($P < 0.05$). However, the mean difference between Laxmi (T_2) and Vaibhav (T_3) sickle is found to be nonsignificant ($P < 0.05$).

Conclusion

It can be concluded that paddy harvesting shall continue to be operated manually by sickles as the topography hinders mechanization. The availability of different designs model, required for harvesting paddy needs to be made available in order to select the best technology. Despite the best efforts put up by different agencies in developing new Technologies, it still could not reach the end users and the demand for such Technologies is immense. In an effort to promote Technologies to every nook and corner, Krishi Vigyan Kendra (KVK) is playing a crucial role in disseminating Technologies and making it available even in the remotes part of the district. Intervention through the introduction of improved laxmi and vaibhav sickle has change the outlook of farmers towards the better Technology. The hands-on experience with the introduced technology has improved their harvesting efficiency, wastage losses and reduced time taken for harvesting. Hence, Farmers friendly tools and implements need to be introduced and disseminated to every corner of the country.

Application of research: Research study of improved serrated sickle.

Research Category: Front line Demonstration, Extension education

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Study area / Sample Collection: Mezoma, Kegwema, Phesema, Botza, Toupheema, New Tesophenyu, Ziphenyu, Tesophenyu, Nsunyu and Sendenyu villages of Kohima district

Cultivar / Variety / Breed name: Cereal crops

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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