IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 11, Issue 12, December 2024

DOI: 10.17148/IARJSET.2024.111260

Impact Assessment of Implementing Unipole Aluminum Ladders for Pepper Harvesting in the Shervaroy Hills under Tribal Sub Plan Programmes of Krishi Vigyan Kendra, Salem

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Abstract: Black pepper (Piper nigrum) is a significant spice crop cultivated in Yercaud of Salem district across an area of 1680 hectares, with a productivity rate of 0.2 tonnes per hectare. Harvesting is a tedious process especially in peak seasons. Krishi Vigyan Kendra, Salem introduced unipole aluminum ladder for pepper harvesting under tribal sub plan programme in the year 2020-21. Arangam, Senthittu and Pelakkadu within the Maramangalam Panchayath of the Shervaroy Hills are the villages in Yercaud block of Salem district in which about more than 650 families are residing and all of them are small and marginal farmers cultivating pepper in an area of around 480 hectares. The process of plucking pepper presents a significant risk, with the potential for falls from bamboo ladders, leading to severe physical and health issues. To address these challenges, the Krishi Vigyan Kendra (KVK), Salem, introduced and supplied a unipole aluminum ladder under the Tribal Sub Plan. This affordable and efficient harvesting equipment is designed to be operated by any individual, aiming to enhance the effectiveness of the harvesting process. the Aluminum unipole ladder stands poised to effectively replace traditional bamboo pole harvesting methods in the Shervaroy Hills. Its multifaceted benefits, including safety, affordability, ease of use, and widespread acceptance among farmers, position it as a valuable asset in enhancing agricultural practices and productivity in the region. Hence the farmers are using the ladder without any fear of falling and efficiency of harvesting is increasing and the cost of cultivation is also reduced.

Keywords: Black Pepper, Harvesting, Unipole Aluminium Ladder, Impact Assessment

INTRODUCTION

The implementation of unipole aluminum ladders for pepper harvesting in the Shervaroy Hills necessitates a comprehensive impact assessment to gauge its efficacy across various domains. This assessment will delve into safety, efficiency, environmental ramifications, economic implications, and social considerations associated with this technological intervention. Safety evaluation includes scrutinizing the safety parameters of the unipole aluminum ladder, emphasizing its structural integrity, stability, and durability, assessing its compatibility with the challenging terrain of the Shervaroy Hills, characterized by steep slopes and uneven surfaces, to ascertain its resilience under such conditions and conducting a comparative analysis with traditional harvesting methods, such as manual picking or wooden ladders, to identify potential safety enhancements afforded by the aluminum ladder.

Efficiency Analysis includes measuring the operational efficiency facilitated by the aluminum ladder in terms of time efficiency, labor optimization, and overall productivity gains, evluating its design attributes, including height adjustability, maneuverability, and accessibility to pepper vines, to determine its efficacy in expediting the harvesting process and quantifying the productivity improvements vis-à-vis traditional methods to ascertain the magnitude of efficiency gains rendered by the aluminum ladder. Environmental Impact Assessment includes examining the environmental footprint associated with the manufacturing and utilization of the aluminum ladder, encompassing energy consumption, carbon emissions, and resource utilization, evaluating the environmental implications of transportation logistics, considering the potential ecological disturbances stemming from vehicular movement in the hills and comparing the environmental impact of the aluminum ladder against conventional harvesting techniques, discerning areas where sustainability measures can be reinforced. Economic Implications includes conducting a cost-benefit analysis encompassing initial investment outlays, maintenance expenditures, and potential savings in labor costs attributed to the adoption of aluminum ladders, delving into the long-term economic dividends, including

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enhanced yield and heightened productivity and assessing the affordability quotient for small-scale farmers in the Shervaroy Hills, while also identifying potential financial impediments hindering widespread adoption.

Social Considerations includes examining the sociocultural impact of introducing technological innovations in traditional agricultural practices, elucidating its influence on community dynamics and indigenous farming traditions, evaluating the inclusivity aspect, scrutinizing the accessibility of aluminum ladders to diverse demographic segments, including women and marginalized groups and eientifying ancillary social benefits, such as improved occupational safety standards and augmented employment opportunities, stemming from the deployment of this technology.

A meticulous impact assessment elucidates the multifaceted ramifications of employing unipole aluminum ladders for pepper harvesting in the Shervaroy Hills. By systematically evaluating safety, efficiency, environmental sustainability, economic viability, and social dynamics, stakeholders can make informed decisions regarding the adoption and optimization of this innovative agricultural technology.

Implementing an extension program in a region presents the challenge of comprehending and attributing its diverse effects to the intervention, given their intricate nature. Typically, the program follows a structured sequence encompassing input, process, output, outcome, and impact. Key considerations such as efficiency, consistency, and effectiveness play pivotal roles in gauging the program's success. Impact assessment entails evaluating both positive and negative, primary and secondary long-term effects resulting from the intervention, whether intended or unintended. Understanding how the intervention influences the target group is crucial for evaluating its efficacy (Kareemulla, 2016).

The impact assessment is the process of determining whether a program has achieved its desired effects on individuals, households, and institutions, and whether these effects can be attributed to the intervention. Impact assessment is fundamental to program planning, implementation, and evaluation. It operates in tandem with monitoring and evaluation processes to ensure that the program advances according to its objectives and to verify alignment with the implementing agency's goals. The assessment measures the attainment of project milestones, outputs, outcomes, and their implications on the targeted population (Krall, 2003).

RATIONALE

Black pepper (Piper nigrum) is a significant spice crop cultivated in Yercaud of Salem district across an area of 1680 hectares, with a productivity rate of 0.2 tonnes per hectare. Introduced to the Shervaroy Hills in the 1970s as an alternative to traditional cereals and millets, it has since become a staple crop. Black pepper offers a range of valuable products including black pepper, white pepper, oil, and oleoresin.

Presently, it is grown either as a monoculture or intercropped with coffee, orange, fig, etc. The predominant variety covering 95% of the area is Panniyur-1, with the remaining portion cultivated with Panniyur-2, Kottanadan, Karimunda, and local Kurumilagu varieties. The majority of pepper vines are aged between 10 to 15 years.

In the villages of Senthittu, Arangam and Pelakkadu within the Maramangalam Panchayath of the Shervaroy Hills, black pepper cultivation spans 480 hectares, managed by 650 small and marginal farmers. Harvesting in these villages typically occurs during February to March. It's crucial to harvest pepper at the appropriate stage of maturity to ensure a dried product with optimal color and appearance. Harvesting commences when one or two berries begin to turn yellow. The spikes are hand-nipped and collected in bags in young plantations.

Since pepper vines often grow on host trees, climbing trees becomes necessary for harvesting. Given that pepper vines can reach heights of 4 to 8 meters, manual harvesting using ladders is the primary method employed. Typically, single-pole bamboo ladders are used as support to ascend the shade trees, predominantly Silver oak (Grevillea robusta), for pepper harvesting (tnau agri tech portal). However, this process is time-consuming, fraught with challenges, and poses risks to laborers and vine health. It requires skilled labor capable of climbing ladders, avoiding ant bites, and overcoming fear of heights. Consequently, pepper harvesting remains limited to laborers with the requisite expertise.

ACTIVITIES IMPLEMENTED BY KVK

The process of plucking pepper presents a significant risk, with the potential for falls from bamboo ladders, leading to severe physical and health issues. To address these challenges, the Krishi Vigyan Kendra (KVK), Salem, introduced and supplied a unipole aluminum ladder under the Tribal Sub Plan. This affordable and efficient harvesting equipment

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is designed to be operated by any individual, aiming to enhance the effectiveness of the harvesting process. Similar activities were done by the Krishi Vigyan Kendra, Namakkal for the farmers of Kolli Hills of Namakkal District (Sharmila Bharathi, and Akila, 2021).

As part of this initiative, farmers received training and demonstrations on pepper cultivation, harvesting techniques, and other intercultural operations employing the unipole aluminum ladder. The focus was on increasing efficiency and ensuring the safety of farmers during the harvesting process. Group meetings were conducted to address farmer queries, and training sessions were organized to provide insights into the utilization of the unipole aluminum ladder. Additionally, frequent crop advisories were disseminated to further support the farmers.

During the pepper harvesting season, farmers utilized the aluminum unipole ladder in 15-year-old pepper plantations, and its effectiveness was observed. Feedback from the farmers was collected, contributing to the ongoing improvement and optimization of the intervention. The introduction of the unipole aluminum ladder not only aimed to mitigate risks associated with traditional harvesting methods but also sought to empower farmers with a safer and more efficient tool for their pepper cultivation endeavors..

OUTPUT OF THE INTERVENTION

In the traditional indigenous method of pepper harvesting, farmers would purchase well-matured bamboo poles, typically 30 to 40 feet in length and 5 to 7 years old, from nearby villages for approximately Rs. 1000 per pole. These poles would undergo a process of preparation, including removal of thorns and straightening by placing stones on them for 30 to 40 days. However, despite these efforts, challenges persisted. Climbing the trees using these bamboo poles resulted in foot and leg pain for the farmers or skilled laborers, limiting their ability to harvest continuously. This intermittent harvesting led to the loss of matured berries and reduced overall yield. Moreover, bamboo poles were found to have a short lifespan of only 2 to 3 years due to susceptibility to rain-induced fungal infections and termite infestations, posing safety risks to climbers.

The introduction of the aluminum unipole ladder brought significant improvements. Farmers gained confidence in reaching vine heights without fear, as the ladder provided stability and grip with its step-like attachments. Safety features, such as a bottom shoe that securely fixed the ladder to the ground or tree base, further enhanced its usability. With the aluminum ladder, farmers were able to safely ascend heights of up to 30 feet and harvest berries weighing up to 100 kg. In terms of efficiency, the aluminum ladder outperformed the bamboo pole method, with farmers harvesting up to 6 pepper vines of 15 years old or 8 vines of less than 10 years old in a day, compared to 4 or 6 vines with the bamboo pole. Additionally, the time taken for harvesting was significantly reduced, with an average of 500 kg of pepper spikes harvested per day using the aluminum ladder, compared to 300 kg per day with the bamboo pole. This efficiency translated into reduced labor requirements, with only 45 laborers needed for harvesting using the aluminum ladder, compared to 72 with the bamboo pole. Consequently, farmers could save substantially on labor costs, spending only Rs. 2000 per day for six hours of harvesting using the aluminum ladder, compared to Rs. 36,000 with the bamboo pole method.

Overall, the adoption of the aluminum unipole ladder not only improved safety and efficiency in pepper harvesting but also resulted in significant cost savings for farmers, highlighting its value as an essential tool for enhancing agricultural productivity.

Cost involved in pepper cultivation

S. No	Particulars	Details	Total cost / 0.4 ha (Rs.)	
			Bamboo Pole	Aluminium Pole
1	Weeding & earthing up	2 times/year @ Rs.200 / 6 hr (7 am -1 pm) 20 female labour / time Total 40 labour @ Rs.200/-	8000	
2	Pruning of standard trees	One time/ year 40 men labour @ Rs.500/-	20000	
3	Cost of Farmyard Manure (including transport)	1 lorry load/ 0.4 ha or 15 t	13000	
4	Farmyard Manure application	20 m @ Rs.500/- men labour	10000	

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5	Harvesting	Bamboo pole - 72 men labour/ 0.4 ha Aluminium unipole ladder – 40 men labour / 0.4 ha @ Rs.500/ men labour	36000	20000
		Total expenditure	**87000**	**71000**
6	Yield	Green berries: 2100 - 2800 kg / 0.4 ha Dry recovery – 3:1 Dry pepper: 700 - 935 kg / 0.4 ha @ Rs.400/kg		
7	Economics	Gross income / 0.4 ha	2,80,000	
		Net income / 0.4 ha	1,93,000	2,09,000
		BCR	3.22	3.94

In the aluminum pole method, farmers could spend only Rs. 20,000 for harvesting, saving up to Rs. 1,000 per 0.4 hectares. Economic analysis revealed that the highest expenditure, amounting to Rs. 87,000, was incurred with the bamboo pole method, compared to Rs. 71,000 with the aluminum ladder. The maximum net return, totaling Rs. 2,09,000, was obtained using the aluminum unipole method. The primary cost of cultivation stemmed from the high labor involvement associated with the bamboo pole method of harvesting. Consequently, farmers were able to save Rs. 16,000 and achieve an additional profit of Rs. 2,09,000 by utilizing the aluminum unipole ladder for harvesting. The cost-benefit ratio was also highest at 1:3.94 with this method.

OUTCOME AND IMPACT OF THE INTERVENTION

Evaluation of impact is the systematic process of assessing the operation, outcomes, and impacts of a program or project by gathering evidence to determine if certain acceptable standards have been met. It also aims to address other pertinent questions, as outlined by Suvedi and Stoep (2016).

The farmers have expressed their satisfaction with the performance of the Aluminum unipole ladder provided by Salem KVK under TSP. This ladder has garnered preference due to several factors: foremost among them is its emphasis on safety. Farmers appreciate the ladder's sturdy construction and safety features, which instill confidence during the harvesting process. Moreover, its affordability is noteworthy, making it accessible to all farmers regardless of gender or skill level. The ladder's design allows for easy handling, facilitating a seamless and efficient harvesting experience. Farmers particularly value the sense of fearlessness it provides, enabling them to tackle the task with confidence.

Furthermore, the ladder proves to be cost-effective, leading to significant savings for farmers. Its innovative weight-bearing bottom stand, resembling a shoe-like structure, offers stability across a vast range of terrains without the need for constant repositioning. Additionally, the locking system, positioned at a height of 20 feet, ensures the ladder remains securely in place, with the ability to extend its length up to 30 feet as needed. The ladder's simplicity translates into minimal maintenance requirements, further enhancing its appeal.

Laborers, including women, have successfully utilized the ladder for pepper harvesting, attesting to its user-friendly nature and versatility. With a total achievable height of 30 feet, the ladder accommodates the needs of various pepper plantations in the region. Notably, farmers from adjoining areas have shown keen interest in adopting this tool for pepper harvesting, underscoring its potential as a widely accepted solution.

CONCLUSION

The Aluminum unipole ladder stands poised to effectively replace traditional bamboo pole harvesting methods in the Shervaroy Hills. Its multifaceted benefits, including safety, affordability, ease of use, and widespread acceptance among farmers, position it as a valuable asset in enhancing agricultural practices and productivity in the region. Hence the farmers are using the ladder without any fear of falling and efficiency of harvesting is increasing and the cost of cultivation is also reduced. Hence the net profit and BCR is increasing in the subsequent years. Now the farmers are in a position to purchase ladder on their own because of increased net profit and doubling of farmer’s income is attainable.

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Yield and Cost Economics of pepper during subsequesnt years in harvesting with pepper ladder

Year	Yield (kg/ha)		Gross Income	Cost of Cultivation	Net Income	BCR
	Green Berries	Dry Berries				
Yield – I Year (2021)	5500	1650	280000	71000	209000	3.94
Yield – II Year (2022)	5800	1740	435000	110000	325000	3.95
Yield – III Year (2023)	6000	1980	495000	125000	370000	3.96

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