Science Discovery Agriculture
2026, Vol. 1, No. 4, pp. 154–159
https://doi.org/10.11648/j.sda.20260104.12

SciencePG
Science Publishing Group

Research Article

Pre-extension Demonstration and Evaluation of a Hand-operated Honey Extractor in Selected Districts of Jimma and Buno Bedele Zones, Ethiopia

Kumale Sadeso*, Husen Abagisa, Abdusalam Aliyyi

Jimma Agricultural Engineering Research Center, Oromia Agricultural Research Institute, Jimma, Ethiopia

Abstract

The study was conducted in potential honey-producing districts of Jimma and Buno Bedele Zones of Oromia Region, Ethiopia, with the objectives of evaluating a hand-operated honey extractor under farmers' conditions, creating awareness among farmers and agricultural experts, and collecting farmers' feedback for further improvement. The machine was evaluated in collaboration with researchers, technicians, and farmers based on extracting capacity, extracting efficiency, and processing time using three replications at each site. The results showed that the machine had an average extracting capacity of 41.5 kg h^{-1}, an average extracting efficiency of 97.6%, and an average processing time of 5.8 minutes. Training and mini-field days were used to create awareness for farmers, development agents, and subject matter specialists. Accordingly, training was provided to 60 farmers, 4 development agents, and 4 subject matter specialists across the four selected sites. A mini-field day was conducted with 45 participants, comprising 33 farmers, 4 development agents, 2 subject matter specialists, and 6 other participants from district agricultural offices. Feedback was collected from 20 respondents using different evaluation criteria. The results showed that 100%, 95%, 100%, 100%, 85%, 90%, and 55% of respondents rated the machine as very good in terms of improving the quality of extracted honey, saving honey wax, saving time, saving labor, portability, suitability, and affordability, respectively. Regarding affordability, 25%, 15%, and 5% of respondents rated the machine as medium, poor, and very poor, respectively. Overall, farmers perceived the hand-operated honey extractor positively, and the technology is recommended for further scaling up among suitable beekeepers and cooperatives.

Keywords

Honey Extractor, Demonstration, Honey Extraction, Farmer Feedback, Portability, Scaling up

1. Background and Justification

Ethiopia is one of the African countries with high potential for honey production. The country has rich floral resources and a large honeybee population due to its diverse ecological and climatic conditions. Beekeeping contributes to household income, nutrition, and environmental conservation. Honey is used as food and medicine and is also an important cash product. [1, 3, 6]

Beekeeping is practiced by smallholder farmers and landless people because it requires relatively little land and investment and can provide financial returns. The sector also has

*Correspondence: Kumale Sadeso (kmlsadeso@gmail.com)

Received: 8 October 2026; **Accepted:** 19 October 2026; **Published:** 3 November 2026

Copyright: © The Author(s), 2026. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

considerable potential for employment and livelihood improvement. Ethiopia has substantial potential for honey and beeswax production; however, actual production remains below the estimated potential because of various production, processing, and marketing constraints. [2, 4, 5, 7, 9, 10]

Southwestern Ethiopia, particularly Jimma and Buno Bedele Zones, has considerable potential for honey production. Many households in these zones engage in beekeeping for income generation and household consumption. Despite this potential, the quality and value of honey produced by farmers can be affected by traditional honey extraction and handling practices. Traditional extraction methods may increase labor requirements, processing time, honey contamination, and losses of honey and wax. [1, 4, 8, 11]

To address these challenges, a hand-operated honey extractor was developed at Jimma Agricultural Engineering Research Center (JAERC). The machine was designed to improve honey extraction, reduce labor requirements, save processing time, and minimize honey and wax losses. The machine had an average extracting capacity of 41.3 kg h^{-1} and an average extracting efficiency of 97.6%.

Therefore, a pre-extension demonstration and evaluation activity was conducted in selected districts of Jimma and Buno Bedele Zones to demonstrate the technology under farmers' conditions, create awareness among farmers and agricultural experts, and obtain farmers' feedback for further improvement and scaling up.

Objectives of the Study

The objectives of the study were:

1) To evaluate the hand-operated honey extractor under farmers' conditions.
2) To create awareness among farmers about the hand-operated honey extractor.
3) To collect farmers' feedback on the machine for further improvement and scaling up.

2. Materials and Methods

2.1. Description of the Study Area

The study was conducted in Gomma and Gera districts of Jimma Zone and Chora and Bedele districts of Buno Bedele Zone of Oromia Region, Ethiopia. The districts were selected based on their potential for honey production, beekeeping activities, and accessibility for implementation of the demonstration and evaluation activities.

The selected kebeles were Bulbula in Gomma district, Gera in Gera district, Hawa Yember in Chora district, and Abalo Sota in Bedele district.

2.2. Materials

Raw materials, including bevel gears, aluminum sheet metal, aluminum bearings, rivets, stainless-steel wire mesh, flat bars, and silver paint, were purchased for manufacturing the machine. The prototype hand-operated honey extractor was manufactured at Jimma Agricultural Engineering Research Center.

2.3. Site Selection, Farmer Identification and FRG Establishment

Purposive sampling was used to select representative districts, kebeles, and participating farmers from Jimma and Buno Bedele Zones. Four districts were selected: Gomma and Gera from Jimma Zone and Chora and Bedele from Buno Bedele Zone.

One kebele was selected from each district based on honey-production potential, beekeeping activities, and accessibility. The selected kebeles were Bulbula in Gomma, Gera in Gera, Hawa Yember in Chora, and Abalo Sota in Bedele.

In each selected kebele, five groups involved in honey production and beekeeping were identified purposively based on their commitment and experience in beekeeping. Three members were selected from each group based on their beekeeping experience and potential to share knowledge with other group members. Accordingly, one Farmer Research Group (FRG) consisting of 15 members was established in each selected kebele.

Demonstration and training activities were conducted at Farmers' Training Centers (FTCs) with the participation of FRG members.

2.4. Evaluation of the Hand-Operated Honey Extractor

The hand-operated honey extractor was evaluated using participatory approaches, including group meetings and field demonstrations. These approaches encouraged the involvement of farmers, development agents, and other participants throughout the implementation process.

The machine was evaluated based on extracting capacity, extracting efficiency, and processing time. Three honey frames were used as the feeding rate for each replication, and three replications were conducted at each site. The evaluation was conducted in collaboration with researchers, technicians, and farmers.

2.5. Awareness-Creation Techniques

A multidisciplinary team of researchers and technicians was organized at Jimma Agricultural Engineering Research Center to conduct awareness-creation activities. Training and mini-field days were used to create awareness among farmers, development agents, and subject matter specialists regarding the operation, benefits, and maintenance of the machine. Training was provided to 60 farmers, 4 development agents, and 4 subject matter specialists at the four selected sites.

2.6. Communication Methods

Extension teaching methods, including individual discussions, group discussions, practical demonstrations, and field-based interaction, were used to facilitate effective communication and learning among researchers, technicians, farmers, development agents, and other agricultural experts.

2.7. Data Collection and Analysis

Both quantitative and qualitative data were collected using observation and measurement, individual interviews, and focus group discussions.

Quantitative data included machine performance indicators such as extracting capacity, extracting efficiency, processing time, number of honey frames processed, and time and labor savings. Data on training and mini-field-day participants were also collected. Farmers' opinions and perceptions regarding the machine were collected using a five-point Likert scale ranging from very poor to very good.

Quantitative data were analyzed using descriptive statistics, including means, frequencies, and percentages. Qualitative information was summarized descriptively.

3. Results and Discussion

3.1. Performance of the Machine

The hand-operated honey extractor was evaluated based on extracting capacity, extracting efficiency, and processing time using three replications and three honey frames as the feeding rate at each site.

The results showed that the machine had an average extracting capacity of 41.5 kg h^{-1}, an average extracting efficiency of 97.6%, and an average processing time of 5.8 minutes.

Table 1. *Performance of the hand-operated honey extractor.*

Site	Replication	Time (min)	Extracting efficiency (%)	Extracting capacity (kg h^{-1})
Gera	TR1	5.80	97.60	41.00
	TR2	6.20	97.02	40.60
	TR3	6.30	96.90	39.40
	Mean	6.10	97.17	40.33
Bulbula	TR1	5.30	97.83	41.09
	TR2	6.02	97.01	42.42
	TR3	5.01	98.22	41.07
	Mean	5.44	97.69	41.53
Hawa Yember	TR1	6.50	97.56	41.00
	TR2	6.00	97.00	42.00
	TR3	5.50	98.00	43.00
	Mean	6.00	97.52	42.00
Abalo Sota	TR1	5.00	98.00	41.98
	TR2	6.00	97.60	42.30
	TR3	5.90	98.40	42.54
	Mean	5.63	98.00	42.27
Overall mean		5.8	97.6	41.5

Source: Own computed data.

3.2. Training of Farmers, Development Agents and Subject Matter Specialists

Both theoretical and practical training was provided to 60 farmers, 4 development agents, and 4 subject matter specialists across the four selected sites.

The training focused on the operation, handling, maintenance, and benefits of the hand-operated honey extractor and provided participants with practical knowledge on the use of the machine.

Table 2. Number of farmers, DAs and SMSs participating in training.

Zone	District	Kebele	Farmers	DAs	SMSs	Total
Jimma	Gomma	Bulbula	15	1	1	17
Jimma	Gera	Gera	15	1	1	17
Buno Bedele	Chora	Hawa Yember	15	1	1	17
Buno Bedele	Bedele	Abalo Sota	15	1	1	17
Total			60	4	4	68

Source: Own data.

3.3. Mini-Field Day

A mini-field day was organized in collaboration with researchers, technicians, and district agricultural experts. The event aimed to create wider awareness of the hand-operated honey extractor and demonstrate its operation and benefits to farmers and other stakeholders.

A total of 45 participants attended the mini-field day, comprising 33 farmers, 4 development agents, 2 subject matter specialists, and 6 other participants from district agricultural offices. Of the total participants, 31 were male and 14 were female.

Table 3. Number of participants in the mini-field day.

Participants	Male	Female	Total
Farmers	21	12	**33**
Development agents	3	1	4
Subject matter specialists	2	0	2
Other participants	5	1	6
Total	31	14	45

Source: Own computed data.

3.4. Farmers' Feedback

Farmers' feedback was collected from 20 respondents through interviews and focus group discussions. Respondents assessed the machine in terms of extracted-honey quality, honey-wax savings, time savings, labor savings, portability, suitability, and affordability.

Table 4. Respondents' perception levels of the hand-operated honey extractor (%).

Criteria	Very poor	Poor	Medium	Good	Very good
Quality of extracted honey	0	0	0	0	100
Honey-wax saving	0	0	0	5	95
Time saving	0	0	0	0	100
Labor saving	0	0	0	0	100
Portability	0	0	5	10	85

Criteria	Very poor	Poor	Medium	Good	Very good
Suitability	0	0	5	5	90
Affordability	5	15	25	0	55

Source: Own computed data.

The results indicated that all respondents rated the machine as very good in terms of improving the quality of extracted honey, saving time, and saving labor. Similarly, 95% of respondents rated honey-wax saving as very good, while 5% rated it as good.

Regarding portability, 85% of respondents rated the machine as very good, 10% as good, and 5% as medium. For suitability, 90% rated the machine as very good, 5% as good, and 5% as medium.

Affordability received relatively lower ratings. Fifty-five percent of respondents rated the machine as very good in terms of affordability, while 25% rated it as medium, 15% as poor, and 5% as very poor. This indicates that affordability may be a constraint for some potential users.

No respondent rated the machine as poor or very poor for quality of extracted honey, honey-wax saving, time saving, labor saving, portability, or suitability. However, some respondents expressed concerns regarding affordability.

Overall, farmers perceived the hand-operated honey extractor positively because it provides an effective means of extracting honey while reducing processing time and labor requirements.

4. Conclusion and Recommendation

4.1. Conclusion

The pre-extension demonstration and evaluation of the hand-operated honey extractor were conducted in selected high-potential honey-producing districts of Jimma and Buno Bedele Zones, Oromia Region, Ethiopia.

The machine was evaluated in collaboration with researchers, technicians, and farmers based on extracting capacity, extracting efficiency, and processing time. The machine showed an average extracting capacity of 41.3 kg h^{-1}, an average extracting efficiency of 97.6%, and an average processing time of 5.8 minutes.

Training and mini-field days were used as the main awareness-creation methods. Training was provided to 60 farmers, 4 development agents, and 4 subject matter specialists at four sites, while the mini-field day involved 45 participants, comprising 33 farmers, 4 development agents, 2 subject matter specialists, and 6 other participants.

Feedback from 20 respondents showed favorable perceptions of the machine. All respondents rated the machine as very good in terms of quality of extracted honey, time saving, and labor saving. In addition, 95% rated honey-wax saving as very good, 85% rated portability as very good, and 90% rated suitability as very good.

Regarding affordability, 55% of respondents rated the machine as very good, 25% as medium, 15% as poor, and 5% as very poor. This indicates that affordability remains an important issue to be considered during further scaling up.

Overall, the hand-operated honey extractor was found to be useful, acceptable, and suitable for improving honey extraction under farmers' conditions. The technology is therefore recommended for further scaling up among suitable beekeeping farmers and cooperatives, with particular attention to affordability and local manufacturing.

4.2. Recommendation

Based on the findings of the study, the following recommendations are proposed:

1) Zonal and district agricultural offices should strengthen linkages with local micro-enterprises and technical enterprises to facilitate local manufacturing and improve farmers' access to the honey extractor.
2) Practical training should be provided to farmers, operators, and development agents on proper operation, handling, routine maintenance, and basic repair of the machine.
3) Local manufacturers and technical enterprises should work to reduce production costs and improve the affordability of the machine for smallholder beekeepers and cooperatives.
4) Further scaling up of the technology should focus on potential honey-producing areas where farmers and cooperatives have a demonstrated need for improved honey extraction technologies.
5) Farmer groups and cooperatives should be encouraged to use and manage the machine collectively where individual ownership is not economically feasible.

Abbreviations

DA	Development Agent
FRG	Farmer Research Group
FTC	Farmers' Research Group
JAERC	Jimma Agricultural Engineering Research Center
SMS	Subject Matter Specialist

Author Contributions

Kumale Sadeso: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing

Husen Abagisa: Data curation, Investigation, Resources, Validation, Writing – review & editing

Abdusalam Aliyyi: Investigation, Resources, Supervision, Validation, Writing – review & editing

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

[1] Sahle H, Enbiyale G, Negash A, Neges T. (2018). Assessment of honey production system, constraints and opportunities in Ethiopia. Pharm Pharmacol Int J. 6 (1): 42-47.

[2] Sebsib Ababor and Yibrah Tekle. (2018). Beekeeping Practice, Opportunities, Marketing, and Challenges in Ethiopia: Review vol. 5, no. 3.

[3] Hailemichael Tsehaye Bahta. (2018). The Status of beekeeping practices and honey production system in Ethiopia: A review. Int J Eng Develop Res. 6 (2): 581-585.

[4] Amsalu Arega, Hailu Mazengia, Muse Haile melekot. (2020). Apiculture constraints and opportunities in Diga and Wayu Tuka Districts, East Wollega Zone, Oromia National Regional. International Journal of Advanced Research in Biological Sciences. 7: 21–33.

[5] Dekebo A, Bisrat D, Jung C. (2019). Opportunities and constraints of beekeeping practices in Ethiopia. J of Api. 34 (2): 169- 180.

[6] Kassa Degu T, Regasa Megerssa G. (2020). Role of beekeeping in the community forest conservation: Evidence from Ethiopia. Bee World. 97 (4): 98-104.

[7] Nega T, Eshete Y. (2018). Review of Ethiopia's global position in honey and other bee products production and marketing: Analysis of sectoral opportunities and limitations. Biomed J of Sci & Tech Res. 10 (3): 7879- 7883.

[8] Michael Kiingwa Kiiti. (2019). Socio-Economic, cultural and institutional factors influencing modern box hives adoption in Kitui County, Kenya.

[9] CSA Central Statistical Agency. (2019). Agricultural Sample Survey, Volume Ii Report on Livestock and Livestock Characteristics.

[10] FAO. Food and Agriculture Organization. (2017). Livestock Primary.

[11] Challa, K., 2010. Assessment of honey production system, marketing and quality in Gomma wereda, south western Ethiopia, MSC thesis (unpublished).