MULTIDISCIPLINARY SCIENTIFIC RESEARCH

BJMSR VOL 9 NO 1 (2024) P-ISSN 2687-850X E-ISSN 2687-8518

Available online at https://www.cribfb.com
Journal homepage: https://www.cribfb.com/journal/index.php/BJMSR
Published by CRIBFB, USA

PRE-EXTENSION DEMONSTRATION OF SHIRO TYPE FIELD PEA TECHNOLOGIES IN THE HIGHLANDS OF GUJI ZONE, OROMIA REGIONAL STATE, ETHIOPIA

Basha Kebede [(a)1] *Tekle Bobo* [(b)] *Dembi Korji* [(c)]

[(a)] *Agricultural Extension Researcher, Bore Agricultural Research Center, Oromia Agricultural Research Institute, Oromia, Ethiopia; E-mail: bsshkbd@gmail.com*
[(b)] *Socio Economics Researcher, Bore Agricultural Research Center, Oromia Agricultural Research Institute, Oromia, Ethiopia; E-mail: bobotekle@gmail.com*
[(c)] *Agricultural Extension Researcher, Bore Agricultural Research Center, Oromia Agricultural Research Institute, Oromia, Ethiopia; E-mail: korjidembi@gmail.com*

ARTICLE INFO

Article History:

Received: 10th October 2023
Reviewed & Revised: 11th October 2023 to 8th February 2024
Accepted: 9th February 2024
Published: 10th February 2024

Keywords:

Agricultural Extension, Demonstration, Field Pea, Bilalo.

JEL Classification Codes:

Q16, O32, O13

Peer-Review Model:

External peer-review was done through double-blind method.

ABSTRACT

Agricultural research centres have released wide varieties to improve field pea production. However, the productivity of field peas is low due to insufficient demonstration of released and adapted varieties at the farmers' level. Hence, demonstrating released and improved varieties is the critical approval for large-scale production of field peas. Therefore, this experiment was exhibited at three highlands to estimate profitability and evaluate the yield of shiro-kind field pea varieties. The Bilalo variety was demonstrated with local varieties by 12 farmers in 2022. Yield and costs of production were collected. The data was analyzed through cost-benefit analysis and descriptive statistics. The result indicated that the Bilalo variety gave a better yield (25.92 Qt/ha) than the local variety (18.33 Qt/ha). Cost-benefit analysis indicated that the Bilalo variety gave better returns (108672 ETB/ha) than the local variety (54022 ETB/ha). Farmers prefer the Bilalo variety because it provides a higher harvest, is more disease tolerant and has a higher market value over the local variety. The improved Shiro field pea variety is significant for yield increment and profit growth. Thus, the Bilalo variety should be used for shiro-type field pea production in highland areas. Additional research is desirable to promote the Bilalo variety through scaling up in the highlands and similar agroecology of the Guji zone.

INTRODUCTION

Field pea is one of annual crops grown in Ethiopia. It is the main nutrition pulse, a low-priced center of protein possessing critical amino acids which ensure high nutritious (Getachew, 2019). It grows in the highland areas. Field pea has the perspective of emergent in flexible ranges of elevations from 1800masl to 3000 masl (Tesfaye, 2021; Gadissa et al., 2022). The crop is also produced in different soil types except salty and drenched circumstances (Endres et al., 2016).

The rank of field pea among the worldwide pulse is second (Muoni et al., 2019; Cherinet & Tazebachew, 2015) and in Ethiopia it occupies the fourth rank of pulse crops and covers 219,927.59 hectares. The yield productivity of field pea is 17.27Qt/ha (Ethiopian Statistics Service, 2022). It is the chief diet peas and inexpensive sources of protein having important amino acid for poor farmers (Kapila et al., 2012). It has environmental and economic significance in Ethiopia. Field pea is appropriate for alternation arrangements to diminish the undesirable influences of mono-cropping on cereal-based farming (Muoni et al., 2019; Fikere et al., 2014). Field pea is also used as a means of revenue generation to small holders and alien exchange for the nation (Shahidur et al., 2010; Girma, 2003).

Regardless of its significance, 1.7 t/ha of field pea productivity is very little (Ethiopian Statistics Service, 2022)

[1]Corresponding author: *ORCID ID: 0000-0002-0781-6526*

https://doi.org/10.46281/bjmsr.v9i1.2185

To cite this article: Kebede, B., Bobo, T., & Korji, D. (2024). PRE-EXTENSION DEMONSTRATION OF SHIRO TYPE FIELD PEA TECHNOLOGIES IN THE HIGHLANDS OF GUJI ZONE, OROMIA REGIONAL STATE, ETHIOPIA. *Bangladesh Journal of Multidisciplinary Scientific Research*, *9*(1), 1-6. https://doi.org/10.46281/bjmsr.v9i1.2185

related to possible production of 3.556 t/ha (Tolessa et al., 2013) and Mogiso (2017) show that 4.17 t/ha field pea was harvested from research stations while the most yield of 7-8 t/ha was harvested in developed nations (Smýkal et al., 2012). The small production of field peas by farmers is mostly due to the use of local varieties (Mogiso, 2017; Ali et al., 2021; Boere et al., 2015). Contrast this, above 80 new field pea diversities have been released to highland areas of Ethiopia (Shumi et al., 2021). These released varieties are not exhaustively produced by the smallholder farmers.

Accessibility and usage of released field pea is a great challenge. Therefore, the government of Ethiopia dedicated demonstration of new and improved varieties to a learning process of farmers about varieties before large scale production. The Highland Guji zone is suitable for field pea cultivation. The crop can be used in shiro type (in powder used to prepare Ethiopian wat eaten with injera) in households and in hostels. Shiro type field pea cultivation is imperative as the variety is typically consumed in the country, including rural and town areas. Meat prices are increasing at an alarming rate and farmers and poor people cannot afford them. However, the field pea can substitute meat since it has amino acids and is a source of protein for farmers and people. Therefore, promotion of field peas in the form of demonstration is desirable. In Guji Zone, farmers used local field pea varieties (Shumi et al., 2021). As a result, small produce of the crop is harvested irrespective of the capabilities of highland parts. Field pea is extremely wanted domestically and countrywide due to its daily nutritional utilization and high value crop for farmers. Therefore, demonstration of such a valuable crop is important as an entry point for large production. The objectives of this study were to assess harvest performance, estimate cost-effectiveness of farmers' circumstances and judge farmers' responses to the promotion of improved shiro field pea in selected highlands of Guji zone.

LITERATURE REVIEW

Demonstration is an event for providing farmers with experiment showing how the new variety, technology and methods can be applied and utilized to bring positive changes on farmers' farm (Ingram et al., 2018). In agricultural demonstration, researchers test and demonstrate the critical advantage of technologies and approaches (Sutherland & Marchand, 2021; Burton, 2020).

Demonstration can be envisaged in actual circumstances to which farmers can relate (Marchand et al., 2019). On farm demonstrations could thus be arranged for transferring the traditional knowledge and skills of farmers to the contemporary and engage the active bottom up learning activities (Cooreman et al., 2021). Demonstration event could provide the opportunity for farmers and other stakeholders to discuss about technology or variety, cooperatively resolve the problems, compare practices in similar to their own and familiar to the practical activities (Ingram et al., 2018). Demonstration recognized as hands-on engagements perceived by organizers and partakers to generate a wide range of positive belongings for farmers, with a principal concentration on certifying actual learning opportunities and empowerment of farmers on demonstration (Adamsone-Fiskovica et al., 2021). Agricultural research institutes visibly show an imperative role in on-farm demonstration to transfer their research output to be more successful on farmers land than advisory services (Kebede & Bobo, 2023; Sutherland et al., 2021).

In Ethiopia, there are different agricultural technology transfer approaches from research to the farmers. Participatory variety selection, pre-extension demonstration, pre scaling up and large scale technology promotions are currently applied approach in the country (Korji et al., 2023). In participatory variety or technology selection, different varieties will be shown to the farmers and the farmers will judge the best variety to their contest. In pre-extension demonstration, farmers themselves participated in the research at their land from land preparation to post management in order to approve the importance of the recommended new or improved variety/technology in their farming circumstance. At this stage farmers decision and preference can determine the adoption of the variety. The best variety selected at pre-extension demonstration stage can further popularized through pre-scaling up and large scale production (Kebede et al., 2023) to increase production and maximize farmers' benefit. In this study context, the pre-extension demonstration intended to test the recommended and the improved shiro type field pea variety and packages to the local context. After the approval of varieties by the farmers the scaling up and large scale production through cluster farming is expected from extension system.

MATERIALS AND METHODS

Site and Farmers' Selection

The demonstration was organized in three (3) highlands. Based on field pea production, Bore, Ana Sora and Arda Jila Mea Boko districts were purposively selected. In each district, two kebeles were selected from the highlands. Finally, in each kebele, three (3) experimental farmers sowed shiro type field pea.

Research Design and Materials

The improved shiro form field pea called Bilalo variety and the local variety was used during 2022 year. Twelve (12) experimental farmers planted Bilalo and local field peas. Each variety was sown on the plot area of 10mx10m. This demonstration used the recommended 100kg/ha of NPS, 100kg/ha of seed, 10cm between plants and 40cm between rows. Knowledge and skills of farmers' on shiro type field pea production was enhanced through training. Mini-field day was arranged at one of the highland districts at maturity time to disseminate the shiro type field pea in the Guji zone.

Data Collection and Analyze

Interview, observation and measurement methods were used in data collection. Cost of inputs (fertilizer, seed, and land rent), labor costs (harvesting, threshing, weeding and sowing) and the yield were collected and analyzed via cost benefit and descriptive statistics. The multiplication of the yield and farm gate price of field peas at threshing time gives the total revenue (TR). The total variable cost (TVC) included costs of fertilizer, seed and labor costs. The land rent was the fixed cost (FC) assumed for field pea production. The summation of TVC and FC gave the total cost (TC). In this demo, the cost-

effectiveness of producing field pea varieties was analyzed via CBA (Cost Benefit Analysis), gained by deducting the TC from the TR. The Benefit Cost Ratio (BCR) was calculated by dividing the TR of each variety by its TC. Farmers' opinions on a field pea trait and varieties were analyzed in descriptive way.

$TR = qxp$ ..... (1)

$TC = TVC + FC$ ..... (2)

$CBA = TR - TC$ ..... (3)

RESULTS AND DISCUSSIONS

Stakeholders' Participation on Training and Mini-Field Day on Shiro Type Field Pea Demonstration

Stakeholders such as development agent, farmers, subject specialists and others were trained to improve production and promote field peas in their farming. Consequently, 33 kebele based Development Agents, 182 farmers, and 25 district agricultural office subject specialists were trained during the demonstration. Moreover, different stakeholders and farmers visited the demonstration site on the mini-field day. Participants witnessed that the improved field pea variety was recognized by the participants, and they were excited to produce the Bilalo variety and decided that the improved variety was delivered by a research center and/or gained from other seed sources. Training and mini-field days have facilitated the technology transfer from research to large extension. Hence, agricultural extension service should concentrate on the capabilities of end users (Kebede et al., 2022).

Table 1. Participants on shiro type field pea demonstration

Capacity building methods used	Stakeholders											
	Development agents			Farmers			Subject Matter Specialist			Others		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Training	23	10	33	160	22	182	16	5	21	4	-	4
Mini field day	5	1	6	40	11	51	4	-	4	2	-	2
Total	28	11	39	200	33	233	22	3	25	6	-	6

The Yield Performance of Improved Shiro Type Field Pea Varieties

From table 2, the Bilalo variety produced 25.92 Qt/ha while the local variety gave 18.33Qt/ha. The improved shiro type variety produced more yield than the local one. The yield gap between Bilalo and the local variety was 7.59 Qt/ha. This indicated that Bilalo yielded more than the local variety. The yield of Bilalo harvested from this demonstration was more than the national productivity of field pea (17.27Qt/ha) in Ethiopia (Ethiopian Statistics Service, 2022). This revealed that the highland districts of Arda Jila Mea Boko, Bore and Ana Sora were most suitable for shiro field pea farming. At demonstration period, Bilalo returned a 32 Qt/ha yield. This designated the use of better-quality such as the Bilalo variety can raise the field pea yield. The yield harvested in the highlands of Guji was comparable to the results of Lemma (2023) who indicated that on the farm and on the station, Bilalo, could have 20.39 Qt/ha and 26.68 Qt/ha, respectively. This revealed that there was yield disparity between on farms and on stations as on station was managed by researchers and on farms were managed by farmers where there were diverse management practices that lead to yield difference. Besides, in some highlands of the Guji zone, the Bilalo variety generated 38.96 Qt/ha (Shumi et al., 2021) which was more than the yield result of this study. This variation might be due to management performance by the farmers and weather conditions. The Bilalo variety was also eaten by wild animals in the vegetative stage. Due to the sweetness of the variety, it was eaten by humans at pod stage. These challenges affected the yield of Bilalo during demonstrations. Hence, Bilalo production should be near to home to supervise and protect humans and wild animals.

Among the selected three districts, the Bilalo variety gave better yield (27qt/ha) at Ana Sora district while there was a lower yield at Arda Jila Mea Boko (Figure 1). Although the variety was affected by wild animals and humans, the Ana Sora highland areas were more conducive to shiro variety production than other highlands of the Guji zone.

Table 2. Yield (Qt/ha) result of demonstrated shiro type field pea varieties

Varieties	N	Minimum	Maximum	Mean	Std. Dev.
Bilalo	12	22	32	25.92	2.88
Local	12	15	22	18.33	2.55

The results of the independent t test showed that there was a 7.58 Qt/ha yield difference between the local and Bilalo varieties (Table 3). Based on the independent t-test ($p = .001 < .05$), the improved Bilalo variety and the local differ in their yield performance.

Table 3. Mean yield difference analysis

Yield	t-test for equality of means (Qt/ha)						
	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Equal variances assumed	6.854	22	.001	7.583	1.106	5.289	9.878
Equal variances not assumed	6.854	21.660	.001	7.583	1.106	5.287	9.880

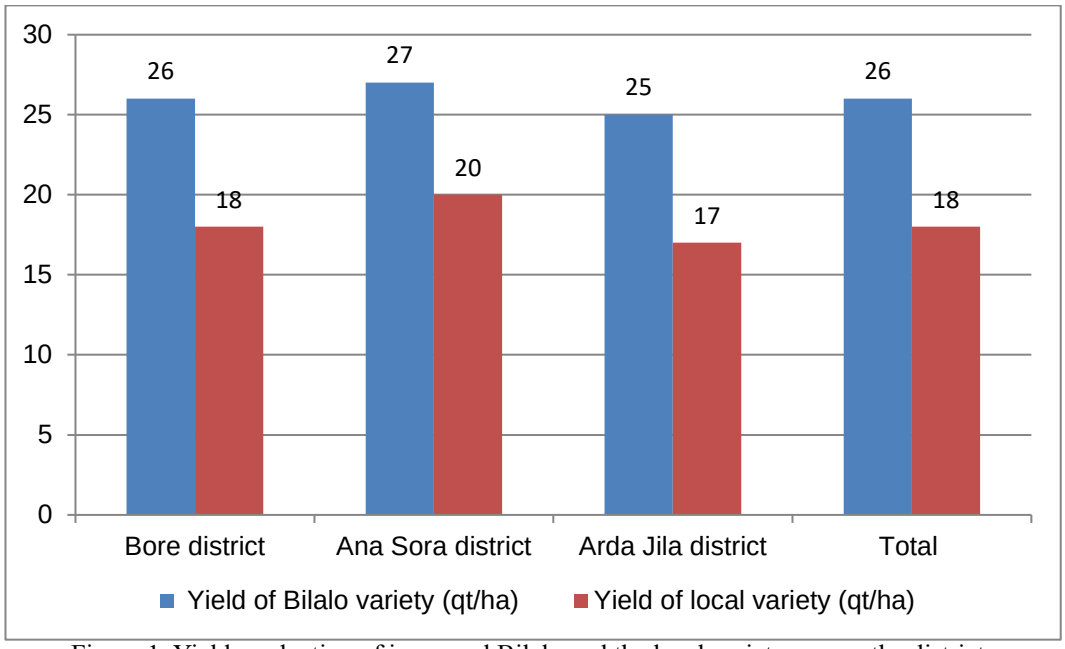

Figure 1. Yield production of improved Bilalo and the local variety among the districts

Cost-Effectiveness of Shiro Type Field Pea Production

More yield and return can determine the acceptability of variety in agricultural production. Adoption of varieties by farmers is interlinked with the amount of return generated from a new variety. More cost-effectiveness variety or technology is easily adopted and produced by farmers. Therefore, estimation of the profitability of the shiro type variety in this study is essential to decide whether the return was financially feasible for the farmers. The local variety cost 4000 ETB/Qt while Bilalo was 5000ETB/Qt in the production year. The return obtained from the Bilalo variety was108672.50 ETB/ha and the local variety generated 54022.50 ETB/ha. Bilalo variety production by farmers in the highlands of Ana Sora, Arda jila Mea book and Bore was more cost-effective (6.25) than the local one (3.5). This discovered that field pea production by improved seed returned twofold from producing the local variety. Bilalo can profit from the lowest of 88800 ETB/ha and the extreme of 139100 ETB/ha (Table 4). This showed that in addition to household consumption branded as shiro wat in Ethiopia, the Bilalo variety can generate excess earnings that can help farmers with their livelihood. The cost benefit analysis showed that the use of the Bilalo variety produced additional profits over the local variety in the Guji highlands.

Table 4. Cost benefit analysis of demonstrated shiro type field pea production

Elements	N	Min	Max	Mean	Std. Dev
Yield of Bilalo (Qt/ha)	12	22	32	25.92	2.88
Yield of Local (Qt/ha)	12	15	22	18.33	2.54
Farm gate price of Bilalo (ETB/ha)	12	5000	5000	5000.00	.00
Farm gate price of local variety (ETB/ha)	12	4000	4000	4000.00	.00
TR of Bilalo (ETB/ha)	12	110000	160000	129583.33	14374.59
TR of local (ETB/ha)	12	60000	88000	73333.33	10138.44
TVC of Bilalo (ETB/ha)	12	12350	13400	13119.17	276.09
TVC of local (ETB/ha)	12	10750	11800	11519.17	276.09
FC (ETB/ha)	12	7500	8000	7791.67	257.46
TC (ETB/ha)	12	19850	21400	20910.83	417.08
CBA of Bilalo (ETB/ha)= TR-TC	12	88800	139100	108672.50	14484.23
CBA of local (ETB/ha)= TR-TC	12	40200	69050	54022.50	10366.59
BCR of Bilalo = TR/TC	12	5	8	6.25	.87
BCR of local = TR/TC	12	3	4	3.5	.52

Farmers' Preferences and Feedbacks on Shiro Type Varieties

The size of land occupied by the field was becoming smaller and smaller as pod borer troubled the local variety. This limits the farmers to producing field peas in larger areas due to low yield and diseases have affected the yield of local field pea. In addition, there was a mixture of seed as it revolved from farmer to farmer for a long period and obtaining pure seed was challenging as the farmers were mentioned during the demonstration. In a demonstration of shiro type field, the Bilalo variety was mostly chosen by experimental farmers as it has market demand, more purity, tolerance to diseases and higher yield. Compared to the local variety, the Bilalo variety has a more number of branches and a more number of pods that used to increase yield. Farmers gave their intension to using the improved shiro type rather than the local one. Moreover, the shiro type field pea was highly demanded because many people use it for day-to-day *wat* preparation. Hence, the supply and production of the Bilalo variety can increase farmers' income, which can diversify farmers' agricultural business for improvement of their livelihood. The dark color of Bilalo, likened by farmers as a small amount of hot pepper powder, is enough for shiro *wat* preparation. This can save farmers and hotel owners from extra expense for the purchase of *berbere* in preparing *wat*.

Table 5. Farmers' choice standards for field pea

Shiro type varieties	Rank give	Possible reasons for rank
Bilalo	1st	Higher yield, disease tolerant and uniformity of seed
Local	2nd	Lower yield, susceptible to disease and no uniformity

CONCLUSIONS

Improved variety is important to boast agricultural productivity. Therefore, demonstrating the role of improved variety on farmers' land is imperative. Hence, technology transfer through agricultural extension is a commitment to demonstration. Bilalo and local varieties were demonstrated to indicate their potential on farmers' land. Based on the findings, the Bilalo variety was a high yielder and generated a feasible return over the local variety. In addition, the Bilalo variety was preferred by experimental farmers because of more market demand, more disease tolerant, higher yield and more purity than the local one. Dissemination of Bilalo variety in the form of large scale and cluster farming is expected from the agricultural extension research. Farmers should sow their field peas around home to escape from wild animals and people attack.

Author Contributions: Conceptualization, B.K.; Methodology, B.K.; Software, B.K.; Validation, B.K., T.B. and D.K.; Formal Analysis, B.K.; Investigation, B.K. and T.B.; Resources, B.K.; Data Curation, B.K. and T.B.; Writing – Original Draft Preparation, B.K.; Writing – Review & Editing, B.K., T.B. and D.K.; Visualization, B.K. and T.B.; Supervision, B.K. and T.B.; Project Administration, B.K.; Funding Acquisition, B.K. Authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement: Ethical review and approval were waived for this study, due to that the research does not deal with vulnerable groups or sensitive issues.

Funding: The authors received direct funding from Oromia Agricultural Research Institute.

Acknowledgments: The authors acknowledged the Oromia Agricultural Research Institute for funding the research. Bore Agricultural Research Center thanked for vehicle and facilitation support. Pulse and Oil Research Team was acknowledged for their technical and research materials delivery.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

REFERENCES

Adamsone-Fiskovica, A., Grivins, M., Burton, R. J., Elzen, B., Flanigan, S., Frick, R., & Hardy, C. (2021). Disentangling critical success factors and principles of on-farm agricultural demonstration events. *The Journal of Agricultural Education and Extension*, *27*(5), 639-656. https://doi.org/10.1080/1389224X.2020.1844768

Ali, Y., Mekibib, F., & Bishaw, Z. (2021). Seed Quality Analysis of Field Pea (Pisum Sativum L.) from Formal and Informal Sources in Enarj Enawuga and Yilmana Densa Districts, West Amhara Region, Ethiopia. *International Journal of Agricultural Science and Food Technology*, *7*(1), 1-13.

Boere, A., T. Rutgers, D. Willems, D. Kidane and W. Dolfen. Business Opportunities Report Oilseeds and pulses #5 in the series written for the "Ethiopian Netherlands business event 5-6 November 2015, Rijswijk, The Netherlands.

Burton, R. J. (2020). The failure of early demonstration agriculture on nineteenth century model/pattern farms: lessons for contemporary demonstration. *The Journal of Agricultural Education and Extension*, *26*(2), 223-236.

Cherinet, A., & Tazebachew, A. (2015). Adaptability of field pea (Pisum sativum L.) varieties under irrigation, Western Amhara Region, Ethiopia. *International Journal of plant Breeding and Genetics*, *9*(1), 28-31.

Cooreman, H., Debruyne, L., Vandenabeele, J., & Marchand, F. (2021). Power to the facilitated agricultural dialogue: an analysis of on-farm demonstrations as transformative learning spaces. *The Journal of Agricultural Education and Extension*, *27*(5), 699-719. https://doi.org/10.1080/1389224X.2021.1969958

Endres, G., Forster, S., Kandel, H., Pasche, J., Wunsc, M., Knodel, J., & Hellevang, K. (2016). Field pea production. NDSU extension service, 1-11.

Ethiopian Statistics Service. (2022). Agricultural Sample Survey 2021/22 (2014 E.C.) Volume I Report on area and production of major crops (Private Peasant Holdings, Meher Season). Statistical Bulletin 593. Addis Ababa, April, 2022.

Fikere, M., Bing, D. J., Tadesse, T., & Ayana, A. (2014). Comparison of biometrical methods to describe yield stability in field pea (Pisum sativum L.) under south eastern Ethiopian conditions. *African Journal of Agricultural Research*, *9*(33), 2574-2583.

Gadissa, B., Biftu, A., & Sida, A. (2022). On-farm demonstration of improved field pea varieties in selected districts of bale highlands, Oromiya national regional state, Ethiopia. *International Journal of Agricultural Research, Innovation and Technology (IJARIT)*, *12*(2355-2022-871), 4-7. https://doi.org/10.3329/ijarit.v12i1.61023

Getachew, T. (2019). Pulse crops production opportunities, challenges and its value chain in Ethiopia: A review article. *Journal of Environment and Earth Science*, *9*(1), 20-29.

Girma, B. (2003, May). The state of grain marketing in Ethiopia. In *Proceedings of the EDRI/IFPRI, 2020 Network Policy Forum on Toward Sustainable Food Security in Ethiopia: Integrating the Agri-Food Chain*.

Ingram, J., Chiswella, H., Mills, J., Debruyne, L., Cooreman, H., Koutsouris, A., ... & Marchand, F. (2018). Enabling learning in demonstration farms: A literature review. *International Journal of Agricultural Extension*, *6*(3), 29-42.

Kapila, R. K., Naryal, S., & Dhiman, K. C. (2012). Analysis of genetic diversity among garden-and field-pea genotypes of higher Indian Himalayas. *Journal of plant biochemistry and biotechnology*, *21*, 286-291.

Kebede, B., Bobo, T., & Korji, D. (2023). Pre-Extension Demonstration of Improved Bread Wheat Technologies at Highlands of Guji Zone, Oromia, Ethiopia. *Austin J Nutr Metab*, *10*(2), 1-4.

Kebede, B., & Bobo, T. (2023). Pre-Extension Demonstration of Kik Type Field Pea (Pisum Sativum L.) Varieties in Selected Highland Districts of Guji Zone, Southern, Oromia, Ethiopia. *Austin J Plant Bio*, *9*(1), 1-4.

Kebede, B., Bayisa, M., Korji D., Amare G., & Delbo, A. (2022). Demonstration of Bee Technologies at Ana Sora District, Guji Zone, Southern Oromia, Ethiopia. *Animal and Veterinary Sciences, 10*(3), 46-54. https://doi.org/10.11648/j.avs.20221003.11.

Korji, D., Kebede, B., & Bobo, T. (2023). PRE EXTENSION DEMONSTRATION OF ORANGE FLESHED SWEET POTATO VARIETIES AT MIDLAND DISTRICTS OF GUJI ZONE, SOUTHERN OROMIA, ETHIOPIA. *Bangladesh Journal of Multidisciplinary Scientific Research*, *8*(1), 21-26. https://doi.org/10.46281/bjmsr.v8i1.2160

Lemma, D. (2023). Participatory Varietal Selection and Agronomic Performance Evaluation of Field Pea (Pisum Sativum L.) Varieties in West Shewa, Ethiopia. *Acta Scientific Agriculture,* 7(2), 82-89.

Marchand, F., Chiswell, H., Ingram, J., Pappa, E., Alexopoulos, Y., Koutsouris, A., ... & Debruyne, L. (2019). D6. 1 Best practice for on-farm demonstration activities, programmes and organisations: An analysis of the interplay between key characteristic. 1–85. Retrieved from https://agridemo-h2020.eu/docs/D6.1_Best practical approaches_final.pdf

Mogiso, M. (2017). Adaptation and Performance on Yield and Yield Components of Field Pea (Pisum sativum L.) Varieties at Adiyo District, Southwestern Ethiopia. *J. Biol. Agric. Healthc*, *7*, 42-46.

Muoni, T., Barnes, A. P., Öborn, I., Watson, C. A., Bergkvist, G., Shiluli, M., & Duncan, A. J. (2019). Farmer perceptions of legumes and their functions in smallholder farming systems in east Africa. *International journal of agricultural sustainability*, *17*(3), 205-218.

Shahidur, R., Chilot, Y., Befekadu, B., & Solomon, L. (2010). Pules value chain in Ethiopia; constraints and opportunities for enhancing exports. *International Food Policy Research Institute*.

Shumi, D., Afeta, T. & Nuguse, R. (2021). Participatory Varietal Evaluation and Selection of Shiro-type Field Pea in Highland Districts of Guji Zone. *American Journal of IT and Applied Sciences Research*, *1*(1), 1-6.

Smýkal, P., Aubert, G., Burstin, J., Coyne, C. J., Ellis, N. T., Flavell, A. J., ... & Warkentin, T. D. (2012). Pea (Pisum sativum L.) in the genomic era. *Agronomy*, *2*(2), 74-115.

Sutherland, L. A., & Marchand, F. (2021). On-farm demonstration: enabling peer-to-peer learning. *The Journal of Agricultural Education and Extension*, *27*(5), 573-590. https://doi.org/10.1080/1389224X.2021.1959716.

Sutherland, L. A., Burton, R. J., Adamsone-Fiskovica, A., Hardy, C., Elzen, B., Debruyne, L., & Flanigan, S. (2021). Inclusivity of on-farm demonstration: gender, age, and geographic location. *The Journal of Agricultural Education and Extension*, *27*(5), 591-613. https://doi.org/10.1080/1389224X.2020.1828115

Tesfaye, D. (2021). Participatory variety selection of Field pea (Pisum sativum L.) and tools to understand farmer's selection criteria in major field pea producing areas of south Eastern Arsi Zone of Ethiopia. *Rea Int J of Plant Sci and Ecol*: 001-006. https://doi.org/10.37179/rijpse.000002

Tolessa, T. T., Keneni, G., Sefera, T., Jarso, M., & Bekele, Y. (2013). Genotype× environment interaction and performance stability for grain yield in field pea (Pisum sativum L.) genotypes. *International Journal of plant breeding*, *7*(2), 116-123.

Publisher's Note: CRIBFB stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.