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RESEARCH ARTICLE

Key Drivers of Perception on Zero Budget Natural Farming in Northern Karnataka

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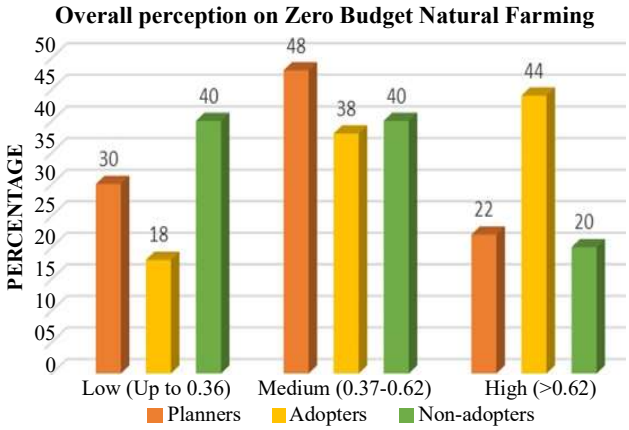
HIGHLIGHTS

- Planners and adopters had large herd sizes, suggesting a potential resource advantage that make them more receptive to zero budget natural farming
- Adopters have the highest innovativeness and annual income compared to others, indicating potential role in trying out new practices
- Education matters for adopters but not planners, indicative of varied level of education influence on zero budget natural farming

GRAPHICAL ABSTRACT



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ABSTRACT

Context: The Zero Budget Natural Farming (ZBNF) is one of the choices available for famers in this direction. ZBNF emphasizes working with nature to produce food, sustain human and land health.

Objective: The study aimed to assess the key determinants of farmers' perception towards zero budget natural farming according to their level of practicing ZBNF in their fields.

Methodology: This research was conducted in Belagavi and Haveri districts of northern Karnataka. Total of 150 respondents were randomly selected from three groups- adopters, planners, and non-adopters. F-test was performed to determine the significance of the data, subsequently Duncan's Multiple Range Test was conducted to identify the specific differences within each parameter under consideration. Correlation Coefficient was applied to determine the relationship between the characteristics of farmers and their perception of ZBNF.

Results and Discussion: The results revealed significant differences among profile of the farmers with adopters showing higher levels of education and income. While land holding size was similar between the group of farmers, but herd size was significantly larger for planners and adopters. Interestingly, adopters with greater resources and higher engagement (information access, social participation, media exposure) displayed a more positive perception of ZBNF. Education of adopters had stronger influence and non-adopters' perception on ZBNF was less influenced, with only land and herd size showing positive correlations.

Significance: These distinct association of profile with perception highlight the need for targeted outreach strategies based on specific farmer characteristics to promote ZBNF across different agricultural communities.

Biodiversity and natural resources in India support diverse crop cultivation across various agro-ecological zones. Historically, agriculture operated in a subsistence manner until the advent of the Green Revolution which achieved food security in the country (Kumar *et al.,* 2024). This led to foodgrain production from 50.8 million tonnes (MT) in 1950-51 to 323.55 MT in 2022-23. However, the agriculture sector's contribution to national income decreased from 18.2 percent in 2014-15 to 16.5 percent in 2019-20 (NABARD, 2024). This increased food production relied on agrochemicals and monoculture led to groundwater depletion and ecosystem instability. According to the Central Water Commission (CWC), around 78 percent of the extracted groundwater is used for irrigation. Despite this usage of water for irrigation, a significant portion of cultivated land (almost half) still relies on monsoon rains (Suryawanshi *et al.,* 2022). The costs associated with cultivation, compounded by high credit rates, escalating prices inputs, and market volatility, often plunge small-scale farmers into a cycle of debt (Khadse, *et al*., 2018*).* Further stagnation of crop productivity, despite the intensified use of inputs particularly impacting livelihood of small-scale farmers (Kumar *et al.,* 2022; Singh *et al.,* 2023).

Additionally, agriculture is the most vulnerable sector to climate change, exposing small and marginal farmers to significant threats (Kumari *et al.,* 2020). Tackling this challenge requires developing an in-depth knowledge of how farmers perceive climate change and there are numerous climate mitigation practices disseminated through various extension agencies, focusing on socio-economic situations and farm attributes (Barman *et al.,* 2022; Shelar *et al.,* 2022). One of the significant strategies is to encourage the use of scientific indigenous agricultural knowledge alongside Climate Smart Agricultural (CSA) practices (Devi *et al.,* 2022). Understanding the effects of climate change on sustainable agriculture is crucial for ensuring food security (Narayana Swamy, 2012).

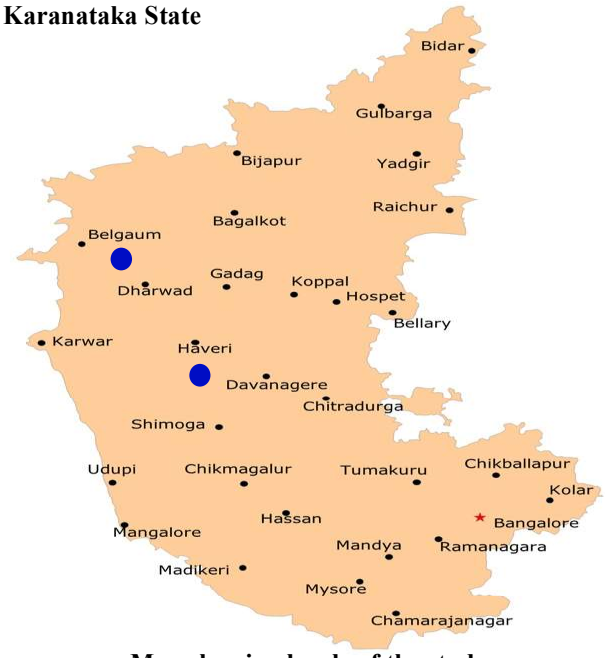
Thus, alternative farming methods can be practised in an eco-system-friendly manner while maintaining and increasing crop productivity (Ashrafi *et al.,* 2024). Zero Budget Natural Farming is a variant of natural farming, originating from Masanobu Fukuoka's experiments documented in "*The One Straw Revolution*" (1975). In this system, inputs such as seeds, fertilizers, and plant protection chemicals are not purchased from the market. The approach focuses on two main axes: agronomic and structural. Agronomically, the aim is to improve soil fertility through diversification, nutrient recycling, and enhancing beneficial biological interactions (Palekar, 2010). Structurally, ZBNF seeks to de-link farmers from external inputs (Palekar, 2013). The Economic Survey defines "zero budget" as farming without the use of credit or external inputs and describes "natural farming" as a method that works in harmony with nature (GoI, 2019). However, this notion is contentious, as from an economic perspective, production without inputs is impossible; even freely available inputs like rainwater and family labour have opportunity costs (Das, 2019). It is clarified that 'zero budget' means zero need for external funding (APZBNF, 2018).

Karnataka played a pivotal role in the dissemination of ZBNF, where the movement reached a substantial number of farmers. The key reason was the collaboration between Subhash Palekar and the Karnataka Rajya Raita Sangha (KRRS), farmers' organization in the state (Khadse *et al.,* 2018). The KRRS of northern Karnataka conducted workshops on ZBNF. Consequently, the government of Karnataka announced the formation of the Farmers' Consultation Committee in July 2018, comprising progressive farmers, to implement the "Zero Budget Natural Farming (ZBNF)" scheme, with an allocation of 50 crores. This program encourages farmers from all agro-climatic zones to receive training in ZBNF and apply it to their fields. With this context, this study was carried out for the following objectives-

- To assess the socio-economic characteristics of farmers
- To study the perception of farmers on ZBNF
- To identify the determinants of perception across the group of farmers

METHODOLOGY

The research was conducted in the two randomly selected districts- Belagavi and Haveri of northern region of Karnataka (latitude 11°30′-18°"N and longitude 74°-78°30E). Northern Karnataka was purposively selected for the following reasons: The 'Zero Bud get Natural Farming' movement was first introduced by farmers' organizations in the northern part of the state. A considerable number of farmers are already practicing ZBNF in Karnataka. The State Agricultural Universities (SAUs) in collaboration with the agricultural department of the state government were providing training to farmers in ZBNF under a government scheme. Ex Post Facto research design



Map showing locale of the study

was utilized for the investigation. The respondents were categorized into three groups: Adopters, Planners, and Non-adopters, based on specific criteria. Adopters were required to have at least 3 years of experience in zero budget natural farming and cultivate a minimum of 2.5 acres using ZBNF methods. Planners needed to be registered in the ZBNF training program since 2019 and should be practicing ZBNF on at least 0.25 acres. Non-adopters were those who were not practicing ZBNF but were well-informed about it. Additionally, all respondents were required to reside in the same village as the Adopters and Planners. From each district, three taluks were selected at random. Specifically, Belagavi district comprised Belagavi, Hukeri, and Kittur taluks, while Haveri district included Savanur and Hirekerur taluks for the study. Twenty-five farmers were randomly selected from each category in each district, resulting in a total of 150 respondents for the study and a structured interview schedule was developed to collect data.

The 'perception' was operationalized as the meaningful sensations of farmers towards 'zero budget natural farming' and was measured using structured interview schedule after conducting relevancy test. It comprised of 15 statements administered on a five-point continuum with weights of 5, 4, 3, 2, and 1 assigned to the positive and negative statements, respectively. The respondents were grouped into three categories by using mean and standard deviation for overall perception. To evaluate the statistical significance of the quantitative data, an F-test was conducted. Upon identifying a significant difference, Duncan's Multiple Range Test (DMRT) was used to find the specific differences. Karl Pearson's Correlation Coefficient was employed to assess the relationship between the characteristics of farmers and their perception of ZBNF, with the correlation coefficients subsequently tested for statistical significance.

RESULTS

Profile of the respondents: Table 1 shown the profile of the respondents in comparison to three groups namely adopters, planners and non-adopters. There were no significant differences in age (around 43 years old) or family size (around 6 members) between the groups. This indicated that age and family size did not significantly influence the zero-budget natural farming. Education level was highest for adopters (7.14 years) and lowest for non-adopters (5.64 years), indicating that better-educated individuals were more likely to adopt ZBNF, aligning with the role of education in accessing and implementing new practices. Land holding size also showed no significant difference (around 10 acres), suggesting minimal impact on decisions related to ZBNF. But herd size was significantly larger for planners (7.38) and adopters (6.68) compared to non-adopters (5.60), indicating a potential resource advantage for those already adopting or planning to adopt ZBNF. Farming experience was similar across all groups (around 15 years). Interestingly, adopters had a significantly higher annual income (Rs 382,000) compared to both planners (Rs 325,000) and non-adopters (Rs 296,000), highlighted the role of financial

Table 1. Distribution of respondents according to their profile characteristics

Independent variables	Planners (n=50)	Adopters (n=50)	Non-adopters (n=50)
Age	43.12±10.45^{a}	44.82±11.51^{a}	42.80±11.02^{a}
Education	5.32±4.32^{a}	7.14±3.61^{a}	5.64±4.42^{b}
Family size	6.46±2.16^{a}	6.70±2.52^{a}	6.10±2.12^{a}
Land-holding	11.20±12.12^{a}	9.10±4.42^{a}	10.40±6.20^{a}
Herd-size	7.38±7.76^{a}	6.68±3.85^{a}	5.60±3.91^{b}
Farming experience	14.66±6.74^{a}	17.06±8.07^{a}	15.70±8.02^{a}
Annual income	325000.00± 111689.25^{a}	382000.00± 105346.85^{b}	296000.00± 84418.78^{a}
Source of information	27.80±4.22^{ab}	29.08±4.12^{a}	27.12±4.07^{b}
Social participation	9.24±1.44^{a}	9.44±1.80^{a}	9.58±1.73^{a}
Extension participation	13.74±2.20^{a}	13.46±2.93^{a}	13.40±2.89^{a}
Extension contact	13.32±3.03^{a}	14.64±2.15^{b}	13.34±2.00^{a}
Mass media exposure	13.12±2.58^{ab}	14.18±1.80^{b}	13.70±2.79^{a}
Innovativeness	16.18±3.00^{a}	18.18±2.77^{a}	15.32±3.04^{b}

(Mean values bearing similar superscript do not differ significantly)

capacity in trying new innovative practices. While all groups accessed information from various sources, social participation, extension participation, and source of information usage were not statistically different. However, adopters had significantly higher extension contact (14.64) and mass media exposure (14.18) compared to planners and non-adopters. Finally, adopters showed the highest level of innovativeness (18.18) compared to planners (16.18) and non-adopters (15.32), underlining the importance of openness to new ideas and risk-taking propensity in adoption behaviour.

Overall perception of respondents towards zero budget natural farming : Based on data from Table 2, it is clear that nearly half (48.00%) of the planners showed a medium perception level towards zero budget natural farming. In contrast, 30.00 per cent had a low perception, and 22.00 per cent had a high perception. This pattern may be due to planners not fully grasping ZBNF. On the other side, the majority (44.00%) of adopters held a high perception level, with 38.00 per cent at a medium level and 18.00 per cent at a low level. This higher level of positive perception among adopters can be attributed to their direct experience and familiarity with ZBNF practices, which likely enhances their understanding and appreciation of its benefits. As for non-adopters, 40.00 per cent displayed both low and medium perception levels, while only 20.00 per cent had a high perception level. This trend indicated that non-adopters, lacking hands-on experience with ZBNF, tend to had a limited understanding of its practical applications and potential benefits, leading to a generally lower perception.

Relationship between perception of the respondents about zero budget natural farming with their profile : Relationship on perception and profile of planners illustrated in Table 3 and it was found that education shown a non-significant negative correlation, indicating higher education levels do not necessarily translate into more favourable perceptions. Significant positive correlations were found with land-holding (r = 0.295*), herd size (r = 0.329*), farming experience (r = 0.295*), annual income (r = 0.364**), access to information sources (r = 0.324*), social participation (r =0.355*), extension participation (r = 0.348*), extension contact (r = 0.406**), mass media exposure (r = 0.401**), and innovativeness (r = 0.306*). These findings suggested that planners with larger landholdings, more livestock, greater farming experience, higher income, better information access, higher social and extension involvement, greater media exposure, and higher innovativeness tend to had more favourable views on ZBNF. Enhancing access to information, promoting social and extension activities, leveraging mass media, and fostering an innovative mind-set can positively influence planners perceptions of ZBNF.

As presented in Table 3, adopters shown significant correlations with their perception on ZBNF for several profile characteristics. Education (r = 0.380**), land-holding (r = 0.498**), herd size (r = 0.516**), farming experience (r = 0.340*), annual income (r = 0.331*), access to information sources (r = 0.381**), social participation (r = .296*), extension participation (r = 0.331*), extension contact (r = 0.431**), mass media exposure (r = 0.314*), and innovativeness

Table 2. Overall perception of respondents towards zero budget natural farming

Perception	Planners (n=50)		Adopters (n=50)		Non-adopters (n=50)	
	No.	%	No.	%	No.	%
Low (< 0.36)	15	30.00	9	18.00	20	40.00
Medium (0.37-0.62)	24	48.00	19	38.00	20	40.00
High (>0.62)	11	22.00	22	44.00	10	20.00
Mean	0.47		0.55		0.42	
SD	0.24		0.20		0.27	

Table 3. Coefficient of correlation between perception of the respondents about ZBNF with their profile

Independent variables	Correlation co-efficient		
	Planners (n=50)	Adopters (n=50)	Non-adopters (n=50)
Age	0.059	0.130	-0.164
Education	-0.114	0.380**	-0.075
Family size	-0.126	0.210	0.227
Land-holding	0.295*	0.498**	0.361**
Herd-size	0.329*	0.516**	0.494**
Farming experience	0.295*	0.340*	-0.137
Annual income	0.364**	0.331*	-0.125
Source of information	0.324*	0.381**	0.076
Social participation	0.355*	0.296*	0.118
Extension participation	0.348*	0.331*	0.166
Extension contacts	0.406**	0.431**	-0.047
Mass media exposure	0.401**	0.314*	0.261
Innovativeness	0.306*	0.487**	-0.003

** = 1.00% level of significance; *= 5.00% level of significance

(r = 0.487**) all showed positive correlations. These results suggest that adopters with higher education, larger landholdings, more livestock, greater farming experience, higher income, better information access, more social and extension involvement, greater media exposure, and higher innovativeness were more likely to have favourable perceptions of ZBNF. This indicated the importance of enhancing these factors to promote positive views of ZBNF among adopters.

Further Table 3 depicted relation on perception and profile of non- adopters. Among non-adopters, the results revealed fewer significant correlations between their profile characteristics and their perception of zero budget natural farming. Significant positive correlations were observed with land-holding (r = 0.361**) and herd size (r = 0.494**), indicating that those with larger landholdings and more livestock tend to have more favourable views of ZBNF. However, education (r = -0.075), farming experience (r = -0.137), annual income (r = -0.125), and extension contact (r = -0.047) showed non-significant or negative correlations, suggesting that these factors do not strongly influence their perceptions. Other variables, such as family size, source of information, social participation, extension participation, mass media exposure, and innovativeness, also did not show significant correlations, indicating that non-adopters' views on ZBNF were less influenced by these factors.

DISCUSSION

As illustrated in Table 1, distinct patterns in their profile characteristics of the respondents was observed. Adopters exhibited higher levels of education, greater access to information, higher income, larger herd sizes, more frequent extension contacts, increased mass media exposure, and greater innovativeness. Adopters higher educational and income levels suggested that these helped farmers with the skills and risks necessary to understand and implement the principles of ZBNF, which often required a departure from traditional farming methods and a greater understanding of natural farming processes (Veni & Harini, 2023). They also reported more extensive contact and greater exposure to mass media, which are crucial channels for disseminating information about new farming practices. These characteristics indicated a proactive approach towards agricultural practices and openness to new farming methods.

Planners, while sharing some similarities with adopters, particularly in terms of herd size and education, fell short in information-seeking behaviours and extension contact. They had a higher herd size, indicating a significant livestock component in their agricultural activities, which could potentially align well with ZBNF principles that emphasize organic inputs. However, their engagement with extension contacts and mass media was relatively limited, which might be hindering their transition to actual adoption. These findings contrasted with Jahanara & Tripathy (2021). To improve their perception through extension, contact there was need for further training and knowledge dissemination to support their decision-making process. This group's position was at a critical juncture, where targeted interventions, such as increased access to resources and extension services, could significantly influence their move towards adopting sustainable practices.

Non-adopters had lower levels of education and income compared to adopters which may limit their access to the necessary resources and information required for adopting ZBNF practices. Their relatively lower engagement with extension contact and mass media suggests that they might not be receiving sufficient exposure to innovative agricultural practices or the benefits of ZBNF. Additionally, non-adopters shown less innovativeness compared to adopters, indicating a possible reluctance to deviate from traditional farming methods or to experiment with new approaches. Overall, enhancing education, information dissemination, and innovative practices among planners and non-adopters could foster wider adoption of ZBNF. These findings collectively underscore the multifaceted nature of adoption decisions, influenced by educational attainment, financial resources, access to information, and personal traits like innovativeness among farmers considering ZBNF.

With regard to overall perception as presented in Table 2, it was observed that planners mean perception score was 0.47 and with a standard deviation of 0.24, indicating a moderate overall perception with a relatively diverse range of views. Planners were moderately receptive to ZBNF, a significant proportion still has low perception. Adopters generally had a more favourable perception of ZBNF, with mean perception score for adopters is higher at 0.55, with a lower standard deviation of 0.20, indicated a more consistent and favourable view of ZBNF among this group The findings align with previous research, as reported by Sarada & Kumar (2018), Priya & Naidu (2019), Rao *et al,* (2021) and Veni *et al*, (2022). In contrast, non-adopters show a more skeptical stance, with their mean

perception score was the lowest at 0.42, and they had the highest standard deviation (0.27), reflecting a broader range of perceptions and greater uncertainty towards ZBNF (Jahanara & Tripathy, 2021 and Veni *et al,* 2022).

The relationship between profile characteristics and perceptions is presented in Table 3. Among planners, significant positive correlations were observed between perceptions and factors such as landholding, herd size, farming experience, annual income, access to information, social and extension participation, extension contact, mass media exposure, and innovativeness (Jahanara & Tripathy, 2021). The strongest correlations were observed with annual income, extension contact and mass media exposure, suggesting that planners who have more frequent contact with agricultural extension services and were more exposed to mass media tend to have more favourable perceptions of ZBNF (Veni & Harini, 2023). This indicated the importance of information dissemination and engagement with extension services in shaping perceptions, potentially aiding planners in transitioning to actual adoption (Kumar *et al*, 2020). This highlighted the importance of knowledge sharing and capacity building initiatives to promote ZBNF among planners. Interestingly, education did not hold a strong influence, suggesting that while knowledge is valuable, hands-on experience and access to practical information might be more crucial for planners in this context.

Among adopters, education, land holding, herd size, annual income, extension contact, mass media exposure and innovativeness exhibited strong positive correlations with perception, at a 1% significance level. A related type of finding was also documented in Sarada & Kumar (2018) Veni & Harini (2023). This suggests that these combined factors created a supportive environment for the adoption and continued practice of ZBNF (Akkamahadevi & Ashok 2021). Education likely reinforced the benefits they are experiencing. Additionally, significant correlations with source of information, social participation, and extension participation underscored the role of active engagement with information channels and community involvement in fostering positive perceptions. Non-adopters, on the other hand, shown different patterns. Significant correlations were found with land-holding and herd size, indicated that these factors somewhat influence their perceptions of ZBNF. This suggests that non-adopters with larger farms and more livestock might be more receptive to ZBNF due to the potential economic benefits it offers. However, unlike adopters and planners, many of these correlations were weaker or even negative. For instance, factors like education and innovativeness shown negligible or negative correlations, suggesting a lack of significant influence on their perceptions the findings conform to the results of Jahanara & Tripathy (2021). This could imply that non-adopters may be less receptive to ZBNF or may be less influenced by potential environmental advantages, and might require a different approach to encourage adoption.

Overall, the analysis revealed that positive perceptions of ZBNF were closely linked to better education, larger herd sizes, more substantial land holdings, and greater engagement with information and extension contact, particularly among adopters and planners. In contrast, non-adopters exhibit weaker or negative correlations, indicating potential barriers towards ZBNF. These insights underscore the need for targeted interventions that enhance access to education, information, and supportive networks to foster positive perceptions and broader adoption of ZBNF practices.

CONCLUSION

The study findings indicated a range of variables that have an impact on the perception of zero budget natural farming among planners, adopters, and non-adopters. Age and family size do not significantly affect perception across all groups. It was observed that factors such as land ownership, herd size, farming experience, annual income, sources of information, participation in social and extension programs, extension contact, media exposure, and innovativeness have a significant, positive effect on the perception of ZBNF among planners and adopters. Conversely, non-adopters showed significant positive correlations only with land-holding and herd size. Thus, there is need for targeted interventions based on the specific group. For planners, continued focus on knowledge sharing, capacity building, and promoting innovation can foster a positive perception of ZBNF. For adopters, highlighting the economic advantages alongside environmental benefits might be reinforcing. However, for non-adopters, a more targeted approach that emphasizes the economic viability of ZBNF on larger farms with livestock holdings could be more effective.

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Authors' contribution: The first and second authors worked together to conceptualize and operationalize the study. The final draft of the manuscript was authorized by the third and fourth authors.

REFERENCES

Akkamahadevi, N. and Ashok, K.B.(2021). Status of zero budget natural farming: An overview. *The Phar. Inno. J.,* **10**(7): 343-347.

APZBNF. (2018). Zero budget natural farming. http:// Apzbnf.in/Faq/. http://apzbnf.in/faq/

Ashrafi, A.; Ahmed, M.B.; Ali, M. Y.; Adhikary, M. M. and Amin, M.R. (2024). Adoption of climate-resilient cropping patterns for sustainable crop production. *Indian Res. J. Ext. Edu*, **24** (1): 63-71.

Barman, I., and Pradhan, K. (2022). Assessing Farmers' Perception on Disaster Risk Mitigation Practices of Flood Prone areas of Dhemaji district, Assam. *Indian Res. J. Ext. Edu*, ***22*** (5): 72-78.

Das, V. (2019). How Seriously Should We Take Sitharaman's Idea of Zero Budget Farming? *The Wire*.

Devi, M.V.; Singh, R.J.; Chauhan, J.K. and Marbaniang, E. K. (2022). Farmers' Resilience to Climate Change in the North Eastern Hill Region of India. *Indian Res. J. Ext. Edu.* ***22*** (5): 290-294.

GoI. (2019). *Economic Survey 2018-19.* New Delhi: Department of Economic Affairs, MOF, GOI.

Khadse, A.; Rosset, P.M.; Morales, H. and Ferguson, B. G. (2018). Taking agroecology to scale: The zero budget natural farming peasant movement in Karnataka, India. *The J. Peas. Stud.*, **45**(1):192-219.

Kumar, R.; Kumar, S.; Yashavanth, B.S.; Meena, P.C.; Indoria, A.K.; Kundu, S. and Manjunath, M. (2020). Adoption of natural farming and its effect on crop yield and farmers' livelihood in India. *ICAR-NAARM,* Hyderabad, India, 130.

Kumar, A.; Meena, H. R.; Rashmi, I. and Kumar, K. (2022). Farmers' perceptions, vulnerability and adaptation strategies to climate change in South-eastern Rajasthan. *Indian Res.J. Ext. Edu*, **22**(3): 1-9.

Kumar, S.; Nagal, G.; Kar, P. and Lal, B. (2024). Impact of organic farming training on the knowledge of farm women: A Pre-Post Analysis. *Indian Res.J. Ext. Edu*, **24**(2): 73-79.

Kumari, N.; Bara, N.; Jha, B. K. and Kumar, R. (2020). Effect of climate change on agriculture and allied activities in Jharkhand: An inference from farmer perception. *Indian Res. J. Ext. Edu.*, **20**(1): 77-79.

Jahanara, K.V.S. and Tripathy, H. (2021). Perception of zero budget natural farming in Visakhapatnam district of Andhra Pradesh, India. *Int. J. Curr. Micro. and Appl. Sci.*, **10**(8): 736–744.

NABARD (2024). *Zero Budget Natural Farming (ZBNF): Implications for Sustainability, Profitability, and Food Security*. Retrieved from https://icrier.org/pdf/Zero-Budget- Natural-Farming.pdf

Narayana Swamy, B.K. (2012). Human resource development for sustainable agriculture and rural development under present climate change, *Indian Res. J. Ext. Edu.,* **12** (Spl. issue 1)*:* 43-53.

Palekar, S. (2010). The philosophy of spiritual farming: Zero budget natural farming. *revised fourth edition. zero budget natural farming research, development & extension movement, Amravati, Maharashtra India*.

Palekar, S. (2013). The principles of spiritual farming: Zero budget spiritual farming–part 2. *Amravati: Zero Budget Natural Farming Research. Development and Extension Movement.*

Priya, N.K. and Naidu, S.M. (2019). Perception and constraints of zero budget natural farming in Nellore district of Andhra Pradesh. *J. Pharm. and Phytoche.*, **8**(6): 2174-2176.

Rao, M.S.; Patro, T.S.S.K.; Lakshman, K.; Ravisankar, N., and Panwar, A.S. (2021). Study on perception and extent of adoption of natural farming practices in Vizianagaram district of Andhra Pradesh, India. *The Phar. Inno. J., **10***(8): 989-993.

Sarada, O. and Kumar, G.S. (2018). Perception of the farmers on zero budget natural farming in Prakasam district of Andhra Pradesh. *The J. Res. PJTSAU,* **46**(1): 34-38.

Shelar, R.; Singh, A.K. and Maji, S. (2022). A measurement tool for the assessment of farmers' perception about impact of changing climate on agriculture in India. *Indian Res. J. Ext. Edu.*, **22**(1): 123-127.

Singh, R.K.; Doharey, R.K.; Kumar, K.; Singh, H. P. and Dutta, M. (2023). Adoption of farming systems approach to increase farmers' income in tarai region of Uttar Pradesh. *Indian Res. J. Ext. Edu*, **23**(3): 49-54.

Suryawanshi, D. and Gupta, S. (2022). Farmers' perspectives on climate change in satpura range agro climatic zone of Madhya Pradesh's. *Indian Res. J. Ext. Edu*, **22** (5): 327-331.

Veni, C.P.; Harini, N., and Sailaja, A. (2022). Perception of farmers on attributes of zero budget natural farming. *Guj. J. Ext. Edu,* **33**(2): 5-11

Veni, C.P., and Harini, N. (2023). Zero Budget Natural Farming (ZBNF) in Vizianagaram District of Andhra Pradesh– A Critical Study. *Agri. Asso. of Texti.Chemi. and Criti. Revie. J.*, **11**(2): 171-179.

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