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Zero Budget Natural Farming (ZBNF) in India: An Economic Perspective

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Abstract

According to a study, more than 10% of people worldwide (approximately 60% of India's population) are expected to face food shortages by 2050 (Smith et al., 2020). In the pursuit of increased production, farmers are driven into a debt trap due to high input costs and volatile market prices. One of the major challenges of agriculture is to develop cultivation practices that are productive and environmentally sustainable. Zero Budget Natural Farming (ZBNF), pioneered by Subhash Palekar, is an eco-friendly and sustainable model in India (Devarinti SR, 2016). The aims of ZBNF are to exclude external inputs in the form of investment in agrochemicals and seeds, to bring farmers out of the debt cycle, and to produce crops using eco-friendly methods (Smith. J, 2020; Barucha, 2020). The recent case study on ZBNF in Andhra Pradesh observed a substantial increase in farmer economic profit mainly due to input cost reduction rather than yield increase (Berger et al., 2025). There are case studies in Karnataka on ZBNF (Khadse et al., 2017). This review focuses on various case studies and peer-reviewed research to examine the impact of ZBNF on input costs, and profitability. ZBNF appears promising in boosting the economy by reducing dependence on subsidized synthetic fertilizers and pesticides. This review discusses the few drawbacks of the ZBNF during the transition period and policies to make it more profitable.

Keywords: *Zero Budget Natural Farming (ZBNF); economic sustainability; cost of cultivation; eco-friendly*

1. Introduction

In the last few decades, as a result of an increase in population size, the demand for food supply increased, which forced the dependency on external inputs like chemical fertilizers, pesticides, herbicides, and hybrid/ genetically modified crop varieties as part of the green revolution (Grab, 2001; FAO, 2017). Meanwhile, the external market-based input cost of production increased, leading to the farmers' dependency on the external credit system and a debt trap. Zero Budget Natural Farming (ZBNF) is an economically sustainable and eco-friendly practice, introduced in India by Subhash Palekar since the 1990s (Palekkar, 2005 & 2006; Devarinti SR, 2016; Tripathi, 2018; Khadse, 2019; D. U. M. Rao, 2023). Over the last decade, interest in ZBNF has surged, and several Indian states have launched programs to promote ZBNF, to attract the focus of scientists, policymakers, and farmers. In the economic perspective, ZBNF rejects the use of chemical fertilizers and pesticides thereby reducing the input costs, which is useful to bailout the farmers from debt trap and to improve net incomes (Khadse, 2019; Gupta, 2020).However, adoption of this model across various soils, crops, climate zones and short- term/ long-term effects needed evaluation through empirical studies (RySS, 2020; Dastagiri, et al., 2022; Aishwarya, 2025). This review focuses on the various studies, which evaluated the efficacy of ZBNF compared to the conventional chemical based farming in the context of costs, yields and profits under ZBNF, and what are the implications for

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agricultural policy. The major empirical studies reviewed are Berger et al. (2025), Duddigan et al. (2022&2023), the CEEW state-level survey (2020), and CESS/IDSAP evaluations (2018–20), Nilojyoti K. et al., (2020) which represent the most comprehensive economic assessments of ZBNF to date.

2. Cost benefit results income impacts and comparisons

- Berger et al. (2025): reported **+123.6% average economic profit** (95% CI +63.1% to +244.0%) and **no meaningful yield loss (+1.5%, 95% CI −5.6% to +19.3%)** across 206 harvests / 128 fields / 26 landscapes in Andhra Pradesh. By lowering input costs, ZBNF increased economic profit by an average of 123.6% relative to agrichemical farming in AP.

- Duddigan et al. (2023) conducted controlled field experiments on **28 farms (44 experiments) across 6 districts** found **ZBNF yields significantly higher overall** (context-specific; benefits attributed largely to mulching).

- Duddigan et al. (2022) carried out the first field experiments onZBNF farming in AP , with findings that the southern (drier) districts of Andhra Pradesh (Anantapur, Kadapa, Nellore, Prakasam) had the highest yield in the ZBNF > conventional > organic treatment. Here more yield observed in ZBNF farming compared to conventional chemical based farming.

- Gupta et al., (2020)of Council on Energy, Environment and Water (CEEW)reported the survey evidence from Andhra Pradesh, which shows **very large reductions in fertiliser/pesticide spending** for ZBNF. In rice, fertiliser/pesticide spending was~90% lower for ZBNF farmers which enormously saves the subsidycost for chemical inputs(fertilizers and pesticides) .It was also observed that ZBNF model is suitable for intercropping and multi-cropping in Anantapur district, AP.

- Galab (2019) from CESS / IDSAP (Andhra Pradesh evaluation, 2018–20) in **Kharif 2018–19 analyzed 661 pure ZBNF vs 704 pure non-ZBNF** and reported **net-income increases for many crops** (e.g., maize +111%, cotton +45%, groundnut +41% in Kharif), with crop- and region-specific heterogeneity.

- Nilojyoti K. et al. (2020) observed that ZBNF played an important role in income generation for the farmers in Purulia, West Bengal.

However, these observations are in contrast with a study in Telegana state, where the yield of maize was reported to be higher in conventional farming than ZBNF and organic farming (Vinay et al. 2020).

3. Challenges and limitations

- Yield gaps: The main risk in the ZBNF model of farming is that economic benefits are time-dependent. Short-term risks related to profits may be incurred during the transition period, and Soil health needs to be rejuvenated for several years (Dastagiri, 2019). Over the period of time, a gradual increase in profit is expected as mulching, microbial activity, and increased organic matter can improve resilience to moisture stress and reduce yield (Duddigan, S. et al., 2023)

- Policy support: Government support is essential to encourage large-scale adoption of ZBNF through policies, incentives, and farmer training programmes.

- Market access and certification: Access to organic markets through certification systems is a drawback to rural farmers. (Reddy, Reddy, & Reddy, 2019).

- Labour-Intensive: Compared to conventional chemical farming, ZBNF practices are labour-intensive.

4. Conclusions and recommendations

Economically, the ZBNF model is a self-sustainable agricultural practice; its aims are to substitute market-based external inputs with domestically prepared biological inputs and labour, and to minimize crop production costs and farmers' reliance on credit. The empirical studies reviewed in this article validated them. In many cases, net profit is due to input cost reduction rather than yield increase. In the year 2019-20, the subsidy expenditure on the Indian economy was estimated to be Rs. 799,960 million (approximately, USD 11,000 million). Reliance on agrochemicals and their import/subsidy costs can be checked by shifting to the ZBNF model. Zero Budget Natural Farming offers a sustainable and economically viable alternative to conventional farming. Additionally, it promotes ecological sustainability, reduces production costs, and enhances farmers' income. The successful adoption of ZBNF requires concerted efforts from farmers, policymakers, and other stakeholders. It requires a few years for the restoration of soil fertility and yield improvement. Government support through policies, incentives, and farmer training programmes is essential to encourage a large-scale shift to ZBNF from conventional farming. Policies are to be made to create market demand and certification. ZBNF can be a fiscally responsible, ecologically regenerative, and economically empowering pathway, but only if policies are tailored to local agro ecological realities.

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