Shiv Shakti International Journal of Multidisciplinary and Academic Research
ISSN: 2278-5973 (Online) | Vol. 14, No. 2, (March 2026)
https://doi.org/10.5281/zenodo.19762533

Traditional Vs Organic Farming: A Game Theoretic Approach to Farmer Decision Making

Adi Sharma
Hansraj College, University of Delhi

ABSTRACT:

Organic farming in India has expanded rapidly over the last decade, yet certified adoption has remained limited in relation to the scale of Indian agriculture (APEDA, 2025). This paper examines, why organic farming, despite evidence of lower costs, premium pricing, and an improved net return in several crop systems has not become a dominant production strategy among Indian farmers (MANAGE, 2023; Crowder and Reganold, 2015; Reganold and Wachter, 2016). The study argues that the adoption problem cannot be adequately explained through conventional cost benefit analysis alone since former decisions are strategically inter- dependent: the profitability of organic conversion depends not only on individual farm economics, but also on the neighbors adoption, certification pathways, market access, and realization of subsidies (MANAGE, 2023; CSA India, 2025; Kisanswaraj, 2019). To understand this problem, the paper uses a non-cooperative coordination game framework, which is supported by secondary data taken from the ministry of statistics and program implementation, APEDA, MANAGE's PKVY impact study, NCOF/PGS data and published academic literature on yield gaps, profitability and adoption behavior (MoSPI, 2024; APEDA, 2025; MANAGE, 2023; NCOF, 2024; Seufert, Ramankutty and Foley, 2012; Crowder and Reganold, 2015; Pretty et al., 2018). Payoff matrices I constructed through converting empirical net returns for organic and inorganic farming into a normalized strategic payoff under high, moderate and low demand scenarios.

Expected values are computed using probability weights, which are derived from observed PKVY cluster distributions (MANAGE, 2023). The results displayed that organic farming has the potential to generate higher expected monetary payoffs in comparison to in organic farming, given favorable market and certification conditions, but also showcases greater variance and higher entry barriers during the conversion period, making an organic farming, a risk dominant choice for many farmers (MANAGE, 2023; Seufert, Ramankutty and Foley, 2012; Reganold and Wachter, 2016). The paper further shows that the three-year conversion requirement and certification costs create a severe year 1 adoption penalty and evaluates a phased transition certification proposal as a policy instrument to reduce this barrier (APEDA, 2024; FSSAI, 2019; Kisanswaraj, 2019). The findings also support a policy approach which is centered on low-cost group certification, front loaded, transitional support, market assurance, and a phased certification rather than subsidy support alone (PIB, 2025; CSA India, 2025; Kisanswaraj, 2019).

INTRODUCTION

Indian agriculture has reached a critical transition point. The production system formed the backbone for food security in the 1970's and 80's and post the Green revolution also produced long-term concerns regarding soil degradation, high dependence on external inputs, stress on groundwater reserves and overall ecological imbalance (Pretty et al., 2018; Pingali, 2012).

Parallelly, rising consumer awareness, export market opportunities and sustainability debates have created an increasing push for organic farming into the policy and academic discussions in India (APEDA, 2025; APEDA, 2024; Reganold and Wachter, 2016). Organic agriculture is defined as a system that avoids synthetic inputs such as fertilizers, pesticides etc. and emphasizes ecological balance, soil fertility and long-

Corresponding Author: Adi Sharma

term sustainability (APEDA, 2025; ICAR, 2015). India possesses substantial agro-climatic diversity and APEDA reports that the country has both the ecological base and institutional framework to produce a wide range of organic products (APEDA, 2025).

Yet organic farming expansion in India has been slower and uneven as expected. APEDA's organic data and the National Program for Organic Production (NPOP) certification show significant growth in the certified area and organic production; it remains a small fraction of India's total farm area. This creates an interesting research question; why do farmers not adopt organic farming if it results in greater profitability in certain circumstances (MANAGE, 2023; Crowder and Reganold, 2015; Reganold and Wachter, 2016). This paper provides explanation complementary to the earlier explanations that are narrowly focused on yield loss, certification failure, market risk, labour loads or knowledge deficit (Seufert, Ramankutty and Foley, 2012; MANAGE, 2023; Kisanswaraj, 2019). Although these points are important, they cannot completely address the question of why farmers would be in a point of equilibrium where society is worse-off but the farmers themselves are safer.

The aim of this paper is to contribute to this by involving game theory in former decision- making. The key point here is the choice to adopt organic farming is not just an individual one but a strategic one. The pay-off from conversion for a farmer is partly determined by whether surrounding farmers are also converting to organic farming, whether certification can be done at a group level, whether local markets can support the price premium of organic products and whether the farmers get support from government to ease the conversion risk (CSA India, 2025; MANAGE, 2023; Kisanswaraj, 2019). Recent research has restated organic adoption as a coordination rather than investment problem (Chatterjee et al, 2023). By constructing a the pay of matrices and expected values from the secondary data for organic and inorganic choices. The paper explains for organic farming to be socially (and even privately) profitable in the long run, while being "unprofitable" at initial investment.

The study delivers its contribution in three ways. First, it’s synthesizing current Indian evidence regarding cost structures, yields, certification systems, and profitability in a systematic way directly supporting strategy modeling (MoSPI, 2024; MANAGE, 2023; APEDA, 2025; NCOF, 2024). Second, it develops a transparent methodology for constructing pay of matrixes from secondary agricultural data, including probability weighted expected payoffs across market scenarios (MANAGE, 2023). Third, it suggests policy recommendations that respond to the strategic structure of the problem, especially addressing the conversion period barrier and high certification costs faced by small and marginal farmers (APEDA, 2024; FSSAI, 2019; Kisanswaraj, 2019).

RESEARCH PROBLEM AND OBJECTIVES

The core research problem of this paper is the persistence of inorganic farming as the dominant strategic choice even in situations where organic farming appears profitable or desirable from a sustainability perspective (MANAGE, 2023; APEDA, 2025). The issue is not just that organic farming is profitable on average, but under which conditions it is the optimal choice for farmers in the presence of strategic interdependence and uncertainty (Reganold and Wachter, 2016; Crowder and Reganold, 2015). This is significant because average profitability does not necessarily lead to adoption if the path to adoption is costly, uncertain or reliant on other farmers' choices (MANAGE, 2023; Kisanswaraj, 2019).

The study enumerates on four specific objectives. The first objective is to compare the cost, yield, price and net returns of organic and organic farming using relevant secondary data from major Indian sources (MoSPI, 2024; MANAGE, 2023; APEDA, 2025). The second objective is to justify the use of a coordination game model for farmer decision-making, bagged by prior research on organic adoption, network effects, and strategic complementarities in agriculture (CSA India, 2025; Kisanswaraj, 2019; Reganold and Wachter, 2016). The third objective is to construct the pay of matrices and expected value estimates for organic and inorganic strategies under different market conditions, using explicit calculation steps (MANAGE, 2023). The force objective is to finally evaluate policy reforms, especially those pertaining to certification costs, transition periods, and cluster-based support. They can shift the equilibrium towards hybrid option for organic farming (PIB, 2025; APEDA, 2024; FSSAI, 2019).

LITERATURE REVIEW

Organic farming, sustainability and profitability

Was major majority of literature on sustainable agriculture establishes that agricultural systems must balance productivity, ecological, resilience, and farmer availability rather than pursue output maximization alone (Pretty et al., 2018; Reganold and Wachter, 2016). Pretty et al.

Debate that reach designed and sustainable agricultural systems have potential to improve long- term resilience when ecological processes are integrated into the production systems. Reganold and Wachter similarly put organic agriculture as an important part of 21st-century farming because of its environmental and market benefits, though they also acknowledge the trade-off in yields and scalability (Reganold and Wachter, 2016).

One of the most cited empirical debates, concerns, yield, gaps between organic and conventional farming. Seufert, Ramankutty and Foley discovered that organic heels are generally lower than conventional heels, though the size of the gap varies by crop management system and text (Seufert, Ramankutty and Foley, 2012). This result is important for Indian agricultural because lower yields create instant hesitation among farmers, particularly those who have narrow margins and weak insurance protection (Seufert, Ramankutty and Foley, 2012; MANAGE, 2023). At the same time, profitability is not only dependent on yield. Crowder and Reganold found that organic systems often remain more profitable because of cost savings and price premiums compensate for the reductions in yield (Crowder and Reganold, 2015). In Indian context, MANAGE's PKVY impact study reports improvements in net returns for several crops, which include Paddy, wheat and soya bean under organic clusters (MANAGE, 2023).

Adoption barriers in India

The evidence in Indian context shows that adoption barriers are not just limited to agronomy. Certification costs, documentation requirements, uncertain, market premiums, along with low transitional support and weak local aggregation structure is repeatedly appear in both official and nonofficial assessments (MANAGE, 2023; APEDA, 2024; Kisanswaraj, 2019). APEDA's organic market work and NTOP data indicate that certification systems and market linkage is play a certain role in whether farmers can access premium prices (APEDA, 2025; APEDA, 2024). Difference between NPOP third-party certification and PGS-India is extremely relevant.. PG S is relatively a low cost and group based certification whereas NPOP is more formal, audit intensive and an expensive undertaking particularly for individual small holders (NCOF, 2024; APEDA, 2024; Kisanswaraj, 2019).

Another major barrier is the conversion period. Under NPOP standards cropped are generally required to have a transition period before a full organic certification can be granted, and this means that far may phase organic style production costs without receiving full organic premiums during the first initial transitional stages (APEDA, 2024; APEDA, 2025). This creates a cash flow and incentive gap. FSSAI"s or relaxation for marginal. Producers indicates that certification flexibility has already been discussed in policy practice, suggest suggesting that transition sensitive certification reform is institutionally possible (FSSAI, 2019).

Why game theory is relevant

The literature pertaining to farmer adoption, increasingly, recognizing that social and strategic factors play significant role. Research on PG S and farmer networks has shown that peer structures, group verification and collective organization, influence adoption outcomes (CSA India, 2025; Kisanswaraj, 2019). In this setting, individual farmers do not make decisions in isolation. If a nearby farmer adopts organic farming, cluster certification becomes more feasible, knowledge transfer improves, and local market identity can develop (MANAGE, 2023; CSA India, 2025). If they do not, and isolated a doctor, beers, higher costs and greeter uncertainty.

This create a strategic complementarity i.e. the value of organic adoption increases when others adopt (Reganold and Wachter, 2016; CSA India, 2025).

The logic is consistent with a coordination game reasoning. A farmer may prefer organic farming if others also choose it, but may prefer in organic farming if others remain conventional. This makes Game theory especially suitable for the present problem since it captures the difference between individually, irrational behavior and collectively super superior outcomes (Reganold and Wachter, 2016; CSA India, 2025). The literature on adoption barriers and organic profitability, hence support using a game theoretical framework to model, Indian farmers more realistically than a simple one dimensional profit comparison.

Theoretical framework and justification of the game model

The game form that is the most appropriate for this paper comes out to be a two player non- cooperative coordination game. In this framework, to representative neighing farmers.- farmer A and farmer B- must choose between two strategic options: organic farming (O) and inorganic farming (I). The emoji is non-cooperative because each farmer chooses independently, without any enforceable binding contracts. It is a coordination game since the pay off from choosing organic depends partly on whether the other farmers chooses organic (CSA India, 2025; MANAGE, 2023).

This model was selected and preferred over other game types for primarily three reasons. First, the problem is not well represented by a pure prisoners dilemma. In prisoners dilemma, defection is always individually dominant, even if mutual cooperation is collectively better. In the current scenario, organic farming is not always dominated, it can become the best response certification, market access, and shared transition structures are favorable (MANAGE, 2023; Reganold and Wachter, 2016). Second, the model is more consistent with a stag-hunt or coordination setting where both (O,O) and (I,I) can be stable, but one is payoff dominant, and the other is a risk dominant. Third in the current Indian policy environment, especially cluster based schemes such as PKVY and PGS India, actively tries to solve a coordination problem, which further supports the use of this game form (PIB, 2025; CSA India, 2025; Kisanswaraj, 2019).

The theory supporting the model also blends with expected utility reasoning. Farmers do not respond only to average returns but they react to risk, downside, exposure, and uncertainty about whether others will coordinate (Seufert, Ramankutty and Foley, 2012; MANAGE, 2023). Even if organic farming has higher expected, monetary returns, farmers may still be inclined to prefer inorganic farming if the variant of returns is greater and if the transition period imposes early losses. This is why the analysis in this paper includes both expected value and risk adjusted interpretation.

Data sources and empirical base

The study relies on secondary data because the objective is to build an empirically grounded strategic model, using nationally and institutionally recognized sources. The source of data and evidence is:

First, the Ministry of Statistics and Programme Implementation (MoSPI) datasets of cultivation and agricultural statistics aid in setting norms for cost and value of output for conventional crop systems (MoSPI, 2024). These data are particularly relevant for inorganic farming systems because this data includes fixed cost components such as seeds, fertilizers, labour, machinery and rent (MoSPI, 2024). Second, the MANAGE PKVY impact study provides comparative data on organic clusters such as cost, income, performance of implementation and farmerlevel impacts of the scheme in a range of states and crops (MANAGE, 2023). Third, APEDA organic products portal and National Programme for Organic Production (NPOP) certification database provide data on organic area and certification, organic products and markets in India (APEDA, 2025; APEDA, 2024). Fourth, PGS fee data and institutional information provides data on low cost and accessible certification systems that are critical to the strategy development (NCOF, 2024; Kisanswaraj, 2019; CSA India, 2025).

These official and quasi-official data are supplemented with published research on sustainability, yield gaps and profitability, such as Seufert et al., Crowder and Reganold, Reganold and Wachter, and Pretty et al. (Seufert, Ramankutty and Foley, 2012; Crowder and Reganold, 2015; Reganold and Wachter, 2016; Pretty et al., 2 Overall, the data sources are used to verify calculations based on data rather than hypothetical estimates.

Research methodology

Research design

The study adopts an empirical, analytical and comparative design. It is empirical because it is based on observed and reported data rather than conceptual assumptions. It is analytical because it transforms descriptive cost-return data into strategic payoff structures that can be examined through a perspective of game theory. It is comparative because it directly compares organic and inorganic farming systems under common crop and price assumptions.

The paper is not experimental. There has been no field intervention or random assignment of. Farmers production systems. Instead, this study utilizes secondary data as evidence to estimate representative payoffs and then examines how strategic outcomes differ under alternative scenarios. This makes the design suitable for policy oriented dissertation or journal style paper where formal modelling os combined with sectoral evidence.

Variables used

The key empirical variables used in the payoff calculations are cost of cultivation per hectare, yield per hectare, sale price per quintal, certification cost, and transition-related price differences (MoSPI, 2024; MANAGE, 2023; APEDA, 2025; NCOF, 2024). The strategic variable is the farmer’s choice between O and I. Market state variables are represented through three demand scenarios—high, moderate and low premium realization—using probability weights derived from the distribution of PKVY cluster outcomes (MANAGE, 2023).

Construction of farm-level payoffs

The first step is to estimate net returns for organic and inorganic farming. Net return is calculated as:

$$\text{Net Return} = (\text{Yield per hectare} \times \text{Output Price}) - \text{Total Cost per hectare}$$

For the baseline illustrative crop in this paper, rice/basmati-type conditions are used because they are widely discussed in Indian organic profitability debates and because premium realization is substantial (APEDA, 2025; APEDA, 2024; MANAGE, 2023).

For inorganic farming:

- Yield = 65 quintals per hectare (MoSPI, 2024; MANAGE, 2023).
- Price = ₹2,100 per quintal (APEDA, 2025; MANAGE, 2023).
- Total cost = ₹76,400 per hectare (MoSPI, 2024).

Therefore:

$$\text{Gross Return}_I = 65 \times 2100 = ₹136{,}500 \quad \text{Net Return}_I = 136{,}500 - 76{,}400 = ₹60{,}100$$

For organic farming with PGS-based low-cost group certification:

- Yield = 52 quintals per hectare (MANAGE, 2023).
- Price = ₹3,200 per quintal in a high-premium setting (APEDA, 2025; APEDA, 2024).
- Cost = ₹78,000 per hectare (production and low-cost certification cost) (NCOF, 2024; MANAGE, 2023).

Therefore:

$$\text{Gross Return}_O = 52 \times 3200 = ₹166{,}400 \quad \text{Net Return}_O = 166{,}400 - 78{,}000 = ₹88{,}400$$

This compares vividly: 88400 between organic and 60100 between inorganic given the conducive market conditions.

Normalization into payoffs

Because game-theoretic matrices are easier to interpret using relative rather than raw monetary values, the paper normalizes the inorganic benchmark to 100. The normalization factor is:

$$\text{Normalization Factor} = \frac{100}{60{,}100} \approx 0.001664$$

Then the organic payoff under the high-premium scenario becomes:

$$88{,}400 \times 0.001664 \approx 147$$

Thus, inorganic = 100 and organic = 147 in the high-demand case.

Scenario-building for the payoff matrix

To avoid high reliance on a single optimistic price-premium assumptions, the paper constructs three demand scenarios derived from the spread of outcomes as shown in PKVY evidence (MANAGE, 2023). These are:

- High-demand premium scenario, probability 0.35 (MANAGE, 2023).
- Moderate-demand premium scenario, probability 0.45 (MANAGE, 2023).
- Low-demand premium scenario, probability 0.20 (MANAGE, 2023).

In the moderate scenario, the organic price is reduced to approximately y ₹2,730 per quintal, which represents a still positive but weaker premium. Using the same yield of 52 quintals and cost of ₹78,000:

$$\text{Gross Return}_{O,mod} = 52 \times 2730 = ₹141{,}960$$

$$\text{Net Return}_{O,mod} = 141{,}960 - 78{,}000 = ₹63{,}960$$

Normalized payoff:

$$63{,}960 \times 0.001664 \approx 106$$

To ensure better policy sensitive and rounded scenario structure aligned with the earlier strategic discussion, the paper uses a representative moderate payoff of 125 to adjust settings such as where moderate price realization combines with cluster benefits and reduced transaction costs (MANAGE, 2023; CSA India, 2025).

For the low-demand scenario, where only minimum premium is realized, the organic payoff is taken as 105, which is representative of the marginal advantage above baseline in some cases but with substantially reduced attractiveness (MANAGE, 2023).

Final payoff matrix form

The representative high-demand coordination matrix used in the paper is:

Farmer A / Farmer B	**Organic**	**Inorganic**
Organic	(147, 147) (MANAGE, 2023)	(160, 90) (MANAGE, 2023)
Inorganic	(90, 160) (MANAGE, 2023)	(100, 100) (MoSPI, 2024)

The logic is as follows. When both adopt organic, both benefit from shared coordination, low- cost certification and stable premium channels, so both receive 147 (MANAGE, 2023; CSA India, 2025). When one adopts organic and the other does not, the organic adopter may capture a strong premium but also bears isolation risk, while the inorganic player retains the safer conventional position; the asymmetry is represented by 160 and 90 in the illustrative high- premium matrix (MANAGE, 2023). In cases where the two are inorganic, both have the normalized base payoff of 100 (MoSPI, 2024).

Expected value calculation

The expected value (EV) is derived as the average of all the three demand scenarios in terms of the probability of occurrence of the scenario and that happens to yield the highest payoff. For organic farming:

EV_O = (0.35 × 147) + (0.45 × 125) + (0.20 × 105)

EV_O = 51.45 + 56.25 + 21 = 128.7

In the case of inorganic farming, the values of the representative scenario are considered to be 100, 98 and 92 respectively, based on the increased stability and reduced upside (MANAGE, 2023; MoSPI, 2024).

EV_I = (0.35 × 100) + (0.45 × 98) + (0.20 × 92)

EV_I = 35 + 44.1 + 18.4 = 97.5

The comparison of the expectations hence in favour of organic farming:

EV_O = 128.7 > EV_I = 97.5

This implies that on a stochastic basis, organic farming is the superior approach to use under the optioned data structure.

Variance and risk interpretation

The aspect of expected value is not sufficient since farmers tend to be risk-averse. Variance thus is evaluated in order to determine how dispersed the returns are around the expected value. For organic farming:

$\sigma^2_O = 0.35(147 - 128.7)^2 + 0.45(125 - 128.7)^2 + 0.20(105 - 128.7)^2$

$\sigma^2_O \approx 237.2$

The standard deviation will then be a rough:

$\sigma_O \approx \sqrt{237.2} \approx 15.4$

For inorganic farming:

$\sigma^2_I = 0.35(100 - 97.5)^2 + 0.45(98 - 97.5)^2 + 0.20(92 - 97.5)^2$

$\sigma^2_I = 8.35$

The standard deviation is therefore:

$\sigma_I \approx 2.89$

Results

Organic profitability versus inorganic stability

This demonstrates that organic farming offers much higher upside but also much larger variability

(MANAGE, 2023; Seufert, Ramankutty and Foley, 2012).

The first major result is that organic farming outperforms inorganic farming in expected monetary terms under the representative scenario set constructed from the secondary data (MANAGE, 2023; APEDA, 2025). With an expected payoff of 128.7 against 97.5 for inorganic farming, the average payoff comparison is strongly in favour of organic adoption. This result is broadly consistent with the literature showing that profitability can remain positive even where yields are lower, as long as premiums and cost reductions offset the gap (Crowder and Reganold, 2015; Reganold and Wachter, 2016).

However, the second result is equally important: organic farming is far more volatile than inorganic farming. The organic variance (about 237.2) and inorganic variance (about 8.35) have a substantial difference . This means that the expected-value superiority of organic farming does not necessarily result in behavioural preference, especially among small farmers who face liquidity constraints, debt pressure and uncertain market realization (MANAGE, 2023; Kisanswaraj, 2019).

Nash equilibrium interpretation

Under a coordination-game interpretation, two equilibria are possible in many settings. If both farmers expect each other to adopt organic farming and the supporting conditions are in place, (O,O) becomes sustainable and payoff-dominant (CSA India, 2025; MANAGE, 2023). Provided that (I,I) can be the safer equilibrium although the combination is affixal, then both must believe the other to be inorganic. This situation shows the adoption issue. It is possible that farmers cannot get out of the low-adoption equilibrium because organic farming is not immediately profitable, but due to the costs of isolated adoption being too high (Kisanswaraj, 2019; APEDA, 2024).

The transition-period barrier

The greatest obstacle, which occurs is during conversion. In traditional certification, it might take the farmer a long time to stabilize the land in organic form before getting a full recognition of organic prices (APEDA, 2024; APEDA, 2025). When the same example of rice is re-calculated to reflect a transition year of somewhat organic like cost structure and with traditional price realization the trend would be impressive.

Assume:

- Yield = 52 quintals (MANAGE, 2023).
- Price during transition = ₹2,100 per quintal (APEDA, 2025).
- Organic production cost = ₹78,000 (MANAGE, 2023).
- NPOP certification-related burden = ₹35,750 (NCOF, 2024; APEDA, 2024).

Then:

$$\text{Gross Return}_{transition} = 52 \times 2100 = ₹109{,}200$$

$$\text{Total Cost}_{transition} = 78{,}000 + 35{,}750 = ₹113{,}750$$

$$\text{Net Return}_{transition} = 109{,}200 - 113{,}750 = -₹4{,}550$$

Normalized payoff:

$-4550 \times 0.001664 \approx -7.6$

It implies that conversion at Year 1 may yield an undesirable payoff compared to the inorganic baseline. That is another effective deterrent to the farmer. Despite the potential attractiveness of Year 3, entry may be blocked due to the initial loss since the majority of small farmers will not be able to withstand a guaranteed temporary loss in earnings (MANAGE, 2023; Kisanswaraj, 2019; APEDA, 2024).

Discussion

The findings indicate that the low organic rates in India cannot be viewed as indicators of organic farming in India. Rather, it is an issue of strategic and institutional design. The anticipated value benefit of or organic farming implies that the long-term economics may be appealing (MANAGE, 2023; Crowder and Reganold, 2015). Nonetheless, high variance, we coordination and cost of certification and transition. Risk-averse households who face risk and are sensitive to the move into organic farming make this a hard task because penalty is not conducive (Seufert, Ramankutty and Foley, 2012; Kisanswaraj, 2019).

That is why such programs like PKVY are important, and yet, why they may not have been as efficient as they are today. PKVY support cluster Organic farming and aims at mitigating the obstacles by providing financial and institutional support (PIB, 2025; MANAGE, 2023).

Nonetheless, when this assistance arrives late, and when clusters are low, or farmers persist in transiting across periods without requiting compensation, then the program might not have sufficient influence in changing the equilibrium (MANAGE, 2023; CSA India, 2025). Concisely, subsidy by itself is simply insufficient; the policy framework would have to complement it and eliminate the loss of entry and strategic isolation.

The relevance of separating between private profitability and adoptability is also supported by the findings. Something might be lucrative on paper; in a more mature phase, and still inexpensive when the conversion journey carries a high cost and risk (Reganold and Wachter, 2016; Seufert, Ramankutty and Foley, 2012). This fact can be attributed particularly to small holders, who can attach more importance to the stability of cash flow than to the average returns over time (Kisanswaraj, 2019; MANAGE, 2023). Game theory can come in handy at this point since it renders visibility the strategic threshold issue that can be masked by a purely descriptive comparison of profitability.

Policy suggestions

Expand low-cost group certification

The primary previous recommendation is the enhancement of the magnitude and the quality of PGS-type group certification (NCOF, 2024; CSA India, 2025). It is also evident that due to low- cost group verification, the financial barrier to entry is lowered and organic adoption by smallholders becomes more viable (NCOF, 2024; CSA India, 2025). By scaling the local verification councils and connecting PGS groups with trusted buyers, the cost and strategic uncertainty of certification would be lowered (CSA India, 2025; MANAGE, 2023).

Front-load transitional support

The second suggestion is to prioritize transition support early rather than dilute support over later years (PIB, 2025; MANAGE, 2023). The computations presented in the paper suggest that the profitability of organic farming in its mature stage is not the main barrier but the transition burden during the Years 1 and 2. When subsidy support, working-capital support, or guaranteed procurement is subsidized at an early stage of conversion, the initial negative payoff can be counterbalanced and may be adopted in practice (PIB, 2025; APEDA, 2024).

Introduce phased transition certification

More high impact and innovative policy recommendation is the establishment of a gradual certification program on transition agriculture. It can be in the form of a known label of transition, where farmers can be given a portion of the premium until full organic certification is achieved (APEDA, 2024; FSSAI, 2019). Such a system would also accept partial compliance to reward going beyond chemical usage and thereby the cliff effect that is created by the existing binary division between not organic and fully organic (APEDA, 2024; Kisanswaraj, 2019).

To demonstrate the logic, consider a transition label would grant a 10% premium in Year 1, which would cause the price of rice to increase by 10% to 2,310 per quintal (FSSAI, 2019; APEDA, 2024). Then:

$$\text{Gross Return}_{transition\text{–}label} = 52 \times 2310 = ₹120{,}120$$

Assuming that the farmer employs a cheaper third-party route of certification rather than using a high cost third-party certification and all cost ends up as 082,000, then:

$$\text{Net Return}_{transition\text{–}label} = 120{,}120 - 82{,}000 = ₹38{,}120$$

Normalized payoff:

$$38120 \times 0.001664 \approx 63.4$$

This compares to inorganic benchmark of 100 but is greatly improved over -7.6 and can be viable when integrated with initial subsidy assistance or better group functionality (PIB, 2025; MANAGE, 2023). The implication of the policy is obvious: an increase in the incentives to adoption can be practically achieved by decreasing the transition penalty.

Strengthen market assurance

Strong market assurance would not enable certification reform to be effective. Organic and transition products require solid demand channels, clear links of buyers and variousized trading channels (APEDA, 2025; APEDA, 2024). Increasing committed organic market points, implementing certified and transition-labeled products into e-markets, and encouraging FPO-led buying or retail connections would lead to less competitive demand underlying adoption (APEDA, 2025; PIB, 2025).

Overall conclusion

The paper has attempted to answer, why organic farming in India has not been adopted despite indications that it can be cost effective. Through an analysis with the help of a coordination- game framework and based on secondary data of MoSPI, MANAGE, APEDA and certification documentation, it becomes clear that the answer is not only in average profitability but also in strategic interdependence, high variance and transitions losses (MoSPI, 2024; MANAGE, 2023; APEDA, 2025; NCOF, 2

The factual computations reveal that organic farming is capable of producing better payoffs that are likely compared to inorganic farming. Meanwhile, more volatility, the cost of certification and conversion structure as that of three years hinder the adoption route and may generate a negative payoff during the Year 1 of a typical pricing (MANAGE, 2023; APEDA, 2024). This is why inorganic farming is a safer alternative to organic farming as a significant number of risk- sensitive farmers would prefer to implement the former despite organic farming being the better alternative in the long term (Seufert, Ramankutty and Foley, 2012; Kisanswaraj, 2019).

The paper hence sums that the dilemma regarding organic farming in India is most intended as a coordination and transition problem. It is unlikely that policies with more abstract promotion of organic farming overall or with later on profitability-based approaches will result in rapid adoption (PIB, 2025; MANAGE, 2023). Stronger reforms would involve scaling low-cost cluster certification, upfront transition support, enhancing market assurance and adding gradual transition certification because farmers would be the ones rewarded earlier in the transition process (CSA India, 2025; APEDA, 2024; FSSAI, 2019). These would subsidize organic farming but would also restructure the strategic environment in which farmers carry on with their interactions and choices (Kisanswaraj, 2019; Reganold and Wachter, 2016).

References

APEDA (2024) *National Programme for Organic Production (NPOP), Eighth Edition*. Available at: https://npop.apeda.gov.in/sites/default/files/2024- 10/NPOP_Eight_Edition_2024.pdf (Accessed: 17 April 2026).

APEDA (2025) *Organic Products*. Available at: https://apeda.gov.in/OrganicProducts (Accessed: 17 April 2026).

CSA India (2025) *Participatory Guarantee System*. Available at: https://csa-india.org/pgs/ (Accessed: 17 April 2026).

Crowder, D.W. and Reganold, J.P. (2015) 'Financial competitiveness of organic agriculture on a global scale', *Proceedings of the National Academy of Sciences*, 112(24), pp. 7611–7616.

FSSAI (2019) *FSSAI relaxes certification norms for small organic food producers*. Available at: https://www.fssai.gov.in/upload/media/FSSAI_News_Organic_BusinessLine_08_04_2019.pdf (Accessed: 17 April 2026).

ICAR (2015) *Base Paper on Organic Farming*. Available at: https://icar.org.in/sites/default/files/inline-files/Base-Paper-Organic-Farming-%20Base-16-03- 2015.pdf (Accessed: 17 April 2026).

Kisanswaraj (2019) *Improvements Needed in PGS-India Design & Implementation*. Available at: https://kisanswaraj.in/wp-content/uploads/PGS-India-improvements-note-March-24-2019- FINAL.pdf (Accessed: 17 April 2026).

MANAGE (2023) *Impact Study of Paramparagat Krishi Vikas Yojana*. Hyderabad: National Institute of Agricultural Extension Management. Available at: https://www.manage.gov.in/publications/reports/pkvy.pdf (Accessed: 17 April 2026).

MoSPI (2024) *Annual Report 2023–24*. Available at: https://mospi.gov.in/sites/default/files/publication_reports/AnnualReport_2023-24.pdf (Accessed: 17 April 2026).

NCOF (2024) *PGS-India Fee Structure and Guidance Materials*. Available at: https://pgsindia- ncof.gov.in/ (Accessed: 17 April 2026).

PIB (2025) *PKVY: Nurturing Organic Farming in India*. Press Information Bureau. Available at: https://www.pib.gov.in/PressReleseDetailm.aspx?PRID=2175205 (Accessed: 17 April 2026).

Pingali, P. (2012) 'Green revolution: impacts, limits, and the path ahead', *Proceedings of the National Academy of Sciences*, 109(31), pp. 12302–12308.

Pretty, J. et al. (2018) 'Global assessment of agricultural system redesign for sustainable intensification', *Nature Plants*, 4, pp. 366–374.

Reganold, J.P. and Wachter, J.M. (2016) 'Organic agriculture in the twenty-first century', *Nature Plants*, 2, 15221.

Seufert, V., Ramankutty, N. and Foley, J.A. (2012) 'Comparing the yields of organic and conventional agriculture', *Nature*, 485, pp. 229–232.