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## Zero Budget Natural Farming in India – from inception to institutionalization

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### ABSTRACT

This paper delineates the growth of Zero Budget Natural Farming (ZBNF) in India. From its origins as a peasant-led social movement in the state of Karnataka, to becoming institutionalized in a state program in Andhra Pradesh, ZBNF is attaining scale and reaching more and more peasant families. We look at some of the key factors that have triggered ZBNFs growth, as well as highlight some of the challenges and contradictions that may arise in the institutionalization process.

### KEYWORDS

Agroecology; KRRS;  
Scaling-up agroecology;  
Subhash Palekar; Zero  
Budget Natural Farming

## Introduction

In India, movements for sustainable agriculture have historically been led and articulated by the Non-Governmental Organization (NGO) sector and urban middle-class activists rather than peasant movements (Brown 2018). On the other hand, successful cases in sustainable agriculture, despite their important achievements, have mostly remained ‘islands of success’ and have not reached a mass scale, becoming a ‘wave of change’ (Gregory, Plahe, and Cockfield 2017).

One exception to these tendencies, we argue, is the Zero Budget Natural Farming Movement (ZBNF) which started in Karnataka. While this is not a movement of peasants from marginal classes or castes, and it does have many urban middle-class members, it is primarily a rural movement composed of and spontaneously spread among middle and small landholding peasants (Khadse et al. 2017). It espouses the neo-Gandhian values of self-reliance and autonomy. It has operated outside the purview of institutional donors and NGO-led networks for sustainable agriculture in India. Among the reasons are rejection of any institutional funding and NGOs by the founder and *guru* Subhash Palekar, who stresses the importance of autonomy.<sup>1</sup> But ZBNF has now spread across the country and

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a series of significant policy initiatives are cropping up. While ZBNF is promoted as a counter-hegemonic movement, challenging dominant ideas of economic globalization, as ZBNF becomes institutionalized in significant state-led policies it may now be at risk of becoming entangled with the very hegemonic institutions its leader has opposed.

From its origins as a social movement in 2002 through 2015, ZBNF spread at the grassroots level through the collective efforts of a constellation of peasant members and movement allies, in what can loosely be termed as the 'ZBNF movement' in Karnataka, and subsequently in other states of India, especially in South India. It barely received any attention from policymakers, scientists or even NGOs. Yet today, one south Indian state, Andhra Pradesh, is attempting to scale up ZBNF across the entire state through comprehensive public policies. Inspired by Andhra Pradesh, other state governments are also showing keen interest and have made initial budgetary allocations. Activists have expressed concern that state-led efforts to scale up ZBNF may depend on international financial institutions with potentially contradictory interests (Saldanha 2018). Yet, Andhra Pradesh's programme on ZBNF is investing resources in farmer-led agroecology, supporting collective learning, women-led social organizations, and recruiting rural youth – a stark contrast to traditional state interventions in agriculture.

This essay attempts to provide an overview of some of the key developments in ZBNF's growth from its inception until its institutionalization. It delineates some key drivers behind its growth and reflects on some of the challenges and contradictions that have arisen in this process. The paper first describes the factors behind scaling up of ZBNF, then it looks at the initial growth of the ZBNF movement in Karnataka, followed by the institutional process and shape of the program in Andhra Pradesh.

Like agroecology, which is a scientific discipline, set of practices, and a social movement (Wezel et al. 2009), ZBNF too signifies both a set of practices and a social movement. We thus use the term ZBNF for both practices and movement.

The key factors behind the scaling up of ZBNF in Karnataka have previously been elaborated by Khadse et al. 2017. These factors were largely drawn from social movement theories like frame theory, resource mobilization theory, and the political opportunity framework, along with empirical evidence from successful cases, and emerging literature on scaling up agroecology (Altieri and Nicholls 2008; Parmentier 2014; Varghese and Hansen-Kuhn 2013; Wijeratna 2018), and were then further developed by Mier y Terán et al. (2018). They identify eight key drivers through an analysis of five emblematic cases of agroecology, which includes the ZBNF movement in India. These are: (1) crises that drive the search for alternatives; (2) social organization; (3) constructivist teaching-learning processes; (4) effective

agroecological practices; (5) mobilizing discourse; (6) external allies; (7) favorable markets; and (8) political opportunities and favorable policies. We will reflect upon these drivers in the context of the unfolding of ZBNFs amplification in India.<sup>2</sup>

## ZBNF practices

ZBNF is an agroecological *farming approach that promotes growing crops in harmony with nature*. The toolkit of ZBNF was developed by its *guru* Subhash Palekar in the 1990's. ZBNF has two major axes, one agronomic and the other structural. On the one hand, it is about improving soil fertility through a number of agroecological principles, including diversification, nutrient recycling, increasing beneficial biological interactions, among others (Palekar 2006). ZBNF opposes use of external inputs or synthetic fertilizers. On the other hand, ZBNF is about de-linking farmers from external inputs and credit markets to create autonomy by not purchasing anything from external actors and especially from corporations (*sensu* Rosset and Martínez-Torres. 2012).

### Four wheels of ZBNF

ZBNF is based on what Palekar calls the four wheels of ZBNF, shown in Table 1. Bijamrita (a seed treatment) and Jivamrita (a soil inoculant) are microbial mixtures which are ready in under 48 h. For those who do not have access to water or labor, a dry version of Jivamrita called Ghanajivamrita is prescribed; this can be prepared once and stored for a year.

Both are sources of beneficial bacteria which have plant protective qualities and stimulate plant growth (Sreenivasa, Naik, and Bhat 2009). Contrary to conventional agriculture, Palekar believes that the soil already has all the

**Table 1.** Four wheels of ZBNF, Source: (APZBNF 2018).

| Four Wheels of ZBNF  | Benefit  |
|--|--|
| Jivamrita: A fermented microbial culture derived from cow dung and urine, jaggery, pulse flour, and soil   | Stimulate microbial activity to make nutrients bio-available; protect against pathogens.             |
| Bijamrita: a microbial coating for seeds, based on cow dung, urine, and lime   | Protects young roots from fungus and seed borne or soil borne diseases                               |
| Acchadana- mulching: Covering the top soil with cover crops and crop residues  | Produces humus, conserves top soil, increases water retention, encourages soil fauna, prevents weeds |
| Whapahasa: Soil aeration, a result of jivamrita and acchadana- represents the changes in water management brought about by improved soil structure and humus content | Increase water availability, water use efficiency, increase resilience to drought                    |

nutrients necessary for plant growth, and thus no external inputs need to be added; instead, the existing nutrients have to be “unlocked” and made bioavailable via jiwamruta (Palekar 2005)- this idea is called *Annapurna*<sup>3</sup> by Palekar.

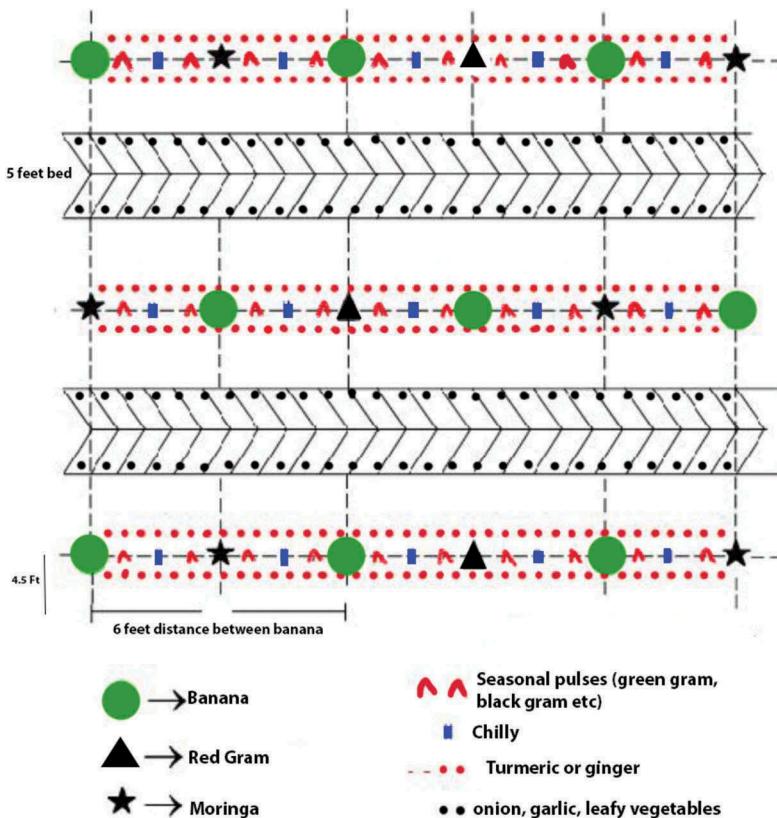
Palekar claims that the urine and dung from one cow are enough for farming 30 acres of land, and so cow ownership by each individual farmer is not necessary. In places where local cows are not available, other alternatives of other animals like buffalos or even human urine can be used,<sup>4</sup> but Palekar claims that indigenous cow breeds have the most and best microbes and are preferable. Native cow breeds are less input-intensive and easier to manage for resource-poor farmers, but their populations have dropped significantly (Balaraju, Tripathi, and Yadav 2017). Some farmers we interviewed in Karnataka had found it hard to find native cows. This was also the case in Kerala (Münster 2016). Some others were purchasing the dung and urine from other farmers or landless herders. In AP, the state government has provided support to farmers to access dung and urine of cows. We visited a traditional pastoralist who had a special urine collection shed constructed via government support under ZBNF. He was collecting the dung and urine and selling these to neighboring ZBNF farmer groups.

Mulching in ZBNF takes various forms. “Live mulching” is promoted with cover crops of a mix of monocotyledons (like millets) and leguminous dichotyledons (like beans). The monocots provide nutrients like potash or phosphate, while the dicots help in nitrogen-fixing (Palekar 2006). Straw mulching is also promoted, using dry crop residue.

Waaphasa means water vapor. Palekar claims that roots absorb water vapor and not water. He promotes a microclimatic condition around the roots, where there is a mix of air and water molecules and rejects over-watering. He prescribes watering only when the sun is high at noon for optimum whaaphasa formation. Palekar claims that up to 90% of water use can be reduced through ZBNF practices making it ideal for rain-fed farming (Palekar 2006).

Palekar also prescribes a number of natural fungicides and pesticides made from locally sourced ingredients like neem leaves, chilies, garlic, tobacco, sour buttermilk, etc. Increasing functional diversity is a critical principle of ZBNF; a number of crop combinations, with a view of increasing functional bio-diversity is proposed by Palekar. He rejects any external additions, including vermicompost made by exotic worm species and instead supports the growth of local earthworms *in situ*.

In terms of farm design, Palekar’s most popular model is what he calls the five-layer model; a type of agroforestry model which integrates trees with various levels of plant canopies, each layer at an optimum level to harvest the sunlight it needs. He proposes various crop and tree combinations, including



**Figure 1.** A version of the five-layer Palekar model. Source: (BNNMurali 2016).

living fences on the edges, and trenches for water harvesting. Careful measurements are provided on how many rows to create and at what distance. Farmers have further adapted this model according to their own needs and in Karnataka, many local versions can be found. See Figure 1 to see a version of the model.

Various other traditional farming models are also practiced by farmers, for example, in ragi (a rainfed millet) cultivation, the guli ragi or square planting model from Karnataka, promotes wider spacing, similar to the System of Rice Intensification (SRI) model that leads to higher yields (Adhikari et al. 2018). The AP government has been promoting the guli ragi and SRI models among its farmers, and income results can be seen in Table 2.

In interviews with farmers in Karnataka, they reveal that the labor requirement for the initial setting up of the five layer model is high. Once the trees are established however, the labor requirement drops significantly over time. Mulching further prevents the requirement for weeding-related labor. Farmers who do not have access to labor for preparing jiwamrita can use

ghanajiwana, jiwamrita's dry form. In comparison to chemical farming, the labor requirement in all models of ZBNF drops over time over time. However, farmers interviewed explained that the labor requirement depends on the size of the farm and the type of crop; sugarcane and paddy are labor intensive. A small farm, under 1–2 ha, can be managed with the labor of the farm family itself, and we interviewed several families who depended purely on their own and extended family support. Farmers with larger land holdings (above 2 ha) have to hire labor. In Karnataka, the availability of farm labor has declined sharply, especially during peak seasons like harvest, and farmers across the board are adopting strategies to cope with labor shortage such as increasing farm mechanization, alternative crops, leasing out land, leaving land fallow among others (Satishkumar and Umesh 2018). In ZBNF models, like the five layer, there is no peak season, as a diversified farm yields throughout the year, further reducing pressure to get labor during times of scarcity.

Practitioners clarify that 'Zero budget' does not literally mean that costs are 'zero', but rather implies that the need for external financing is zero, and that any costs incurred can be offset by a diversified source of income which comes via farm diversification rather than dependence on one monoculture (APZBNF 2018). Palekar has faced some resistance because of the usage of the terms 'zero budget,' as many questioned the accuracy of the term, as some costs are involved. Recently, he changed the name of ZBNF to Subhash Palekar Natural Farming (SPNF). This has created confusion and many, including the AP government, continue to use the term ZBNF.

The AP government has taken the help of expert NGOs, each of whom have their own package of practices which draw heavily from Palekar's ZBNF, but also include many other practices commonly used in agroecological systems, such as pheromone traps, yellow plates, trap crops, NADEP<sup>5</sup> composting, *navdhanya* or nine seeds planting system, bird perches, light traps, sheep manure, green leaf manure, paddy and fish combined farming among others.

### ***Landholding of ZBNF farmers***

ZBNF is positioned as a solution to the debt crisis among Indian farmers. Most recent available figures by the government of India show that about 52% of the agricultural households in the country are in debt (NSSO 2014). Among the major states, Andhra Pradesh had the highest share of indebted agricultural households (92.9%). Karnataka is at 77%. Although these figures include farmers with land holding under 0.01 ha and tenant farmers, the report states that those with over 2 ha of land had higher levels of debt- these households also derived a larger proportion of their income from cultivation. As farming is a major source of income for the

key ZBNF practicing group of farmers, improving net incomes in farming is a key aim of ZBNF.

According to a survey of 97 farmers in Karnataka by Khadse et al. (2017), almost all ZBNF farmers possessed land, with 28.9% in the small farmer category (<2 ha), 43.3% in the medium size category (2–10 ha), and 27.8% in the large categories. The majority had access to some form of irrigation and 68% owned a cow. None of the farmers were absentees. However, the ZBNF movement did not make any special efforts to reach marginal or landless farmers aside from waiving of the fees for training camps. A ZBNF leader admitted that it is difficult for a marginal farmer to leave their farm for five days for training, which is the typical length of Palekar's training camp.

In the case of Andhra Pradesh, the government's extension model is based on group approaches through Self Help Groups (SHGs) and claims to be putting a special emphasis on groups of landless and women farmers, elaborated later in the paper.

### **Benefits of ZBNF**

**Table 2**, Net incomes in food crops, ZBNF versus Non-ZBNF, Figures from the government of Andhra from the Kharif crop in 2017. Source: (APZBNF 2018)

In Karnataka, out of 97 farmers surveyed (see **Table 3**), 85% reported improved income, 90% reported reduced production costs, 92% reported reduced need for credit, 91% reported improved quality of produce, 78% reported improved yields.

There is ample anecdotal evidence of ZBNFs ecological benefits reported by farmers – but no comprehensive study has been carried out yet, aside from some ongoing studies by the government of AP. However, there is ample scientific evidence on the ecological benefits of the particular practices promoted by ZBNF-such as cow based microbial mixtures, mulching, improving functional on farm bio-diversity, enhancing soil microbial activity, agro-forestry systems, on-farm water conservation, cover cropping among others (Altieri 2018; Asha 2015).

**Table 2.** Comparison between net incomes in various food crops grown in ZBNF versus chemical farming, and indicates that ZBNF led to a better net income. This has also been demonstrated in the case of paddy by Amareswari and Sujathamma 2014 in Chittoor district in AP. Source: (APZBNF 2018).

| Food Crops | Cost of cultivation |          | Net Income |          |
|------------|---------------------|----------|------------|----------|
|            | ZBNF                | Non ZBNF | ZBNF       | Non ZBNF |
| Paddy      | 30,983              | 43,839   | 60,743     | 40,335   |
| Guli Ragi  | 7375                | 8125     | 42789      | 27717    |
| Ragi       | 6875                | 7625     | 31590      | 25195    |
| Blackgram  | 15775               | 18595    | 39034      | 27243    |

**Table 3.** Efficacy of ZBNF in some social, economic, agroecological indicators (%) as reported by farmers in Karnataka (n = 97). Highest values are in bold (Khadse et al. 2017).

| Number of farmers (%) | Yield       | Soil Conservation | Seed diversity | Pest attacks | Quality of produce | Seed autonomy | Household food autonomy | Selling price | Income      | Production costs | Need for Credit | Health       |
|-----------------------|-------------|-------------------|----------------|--------------|--------------------|---------------|-------------------------|---------------|-------------|------------------|-----------------|--------------|
| Has Decreased         | 12.8        | 2.1               | 12.8           | <b>84.1</b>  | 4.4                | 2.4           | 4.9                     | 7.9           | 4.8         | <b>90.9</b>      | <b>92.5</b>     | 0            |
| No Change             | 8.5         | 4.3               | 10.3           | 4.5          | 4.4                | 4.9           | 7.3                     | 34.2          | 9.5         | 2.3              | 3.8             | 0            |
| Has Increased         | <b>78.7</b> | <b>93.6</b>       | <b>76.9</b>    | 11.4         | <b>91.1</b>        | <b>92.7</b>   | <b>87.8</b>             | <b>57.9</b>   | <b>85.7</b> | 6.8              | 3.8             | <b>100.0</b> |

## Scaling up of ZBNF among farmers

### ***Early years 2002–2006: farmer-led social movement in Karnataka***

#### ***Social organization***

Karnataka became the crucible where the experiment of ZBNF first succeeded in reaching a wide number of farmers, turning into a popular movement (Khadse et al. 2017).

A decisive factor behind the scaling up of ZBNF in Karnataka was the coming together in 2002 of the *guru* of ZBNF, Subhash Palekar, with the social organization of Karnataka Rajya Raita Sangha (KRRS)- the largest farmers movement of the state. Interviews with both Palekar and KRRS leaders reveal that Palekar did not have a mass following in his own neighboring state of Maharashtra. It was when a KRRS leader from north Karnataka came across Palekar's teachings, he invited him to Karnataka and organized a series of workshops to address the growing crisis of farmer suicides, indebtedness, and ecological crisis. These workshops became popular among farmers and the social organization of KRRS became the culture medium upon which ZBNF first spread. Mier Y Terán et al. (2018) highlight the importance of social organization and crises to the scaling up of agroecology, and in the case of ZBNF too, these were factors for its initial growth.

#### ***Local champions***

When Palekar was first invited to Karnataka, he received a mixed response. At one workshop in 2002 in Hubli Karnataka, notes a KRRS leader, the majority of farmers abandoned a five-day ZBNF workshop, leaving only a handful of remaining participants. Yet one of the participants, Krishnappa, a heavily indebted farmer at the time, was so convinced by Palekar's discourse that he abandoned chemicals and started practicing ZBNF.<sup>6</sup> Krishnappa's 2-ha farm became one of the most successful model farms in ZBNF. Krishnappa's success convinced others to pay attention to ZBNF. He became a local trainer and advisor for other farmers. Over the years, hundreds of such local champions, many of whom we have interviewed and met, have developed across the state of Karnataka. They have volunteered their own time and donated their own resources for mentoring new ZBNF farmers. Today, there is an official list of such trainers available across every district of Karnataka that new farmers can reach out to. None of these trainers are paid.

Mier Y Terán et al. (2018) indirectly identify local champions and leadership as a factor in achieving scale, while Nicholls and Altieri (2018) refer to the importance of 'lighthouses', which are demonstration and training farms led by NGOs or farmers themselves as effective mechanisms for scaling up agroecology. Khadse et al. (2017) analyze the importance of local leadership, called bridge or grassroots leaders to agroecology movements, who carry out movement goals on the ground. In the case of ZBNF, farmer champions, called 'lighthouses,' have turned out to be a critical factor in ZBNF's growth.

### ***Self-organized pedagogical activities and allies***

According to our interviews with ZBNF leaders, by 2006 the movement had gathered many new allies, and volunteers, beyond the farmers' movement. They were collectively organizing massive training workshops-with the participation of thousands of farmers over five to seven days. One workshop in the town of Kudalsangamma in North Karnataka recorded over 5000 farmer participants.<sup>7</sup> The entire operation was volunteer-led with the support of a local rural cooperative bank – DCC Bank. This model of self-organized training workshops became the cornerstone of the ZBNF movement. The movement operated without a central organization or a bank account (Khadse et al. 2017).

Palekar's massive training, reminiscent of a religious retreat, are a unique feature of the ZBNF movement. Palekar goes into a detailed explanation of agroecological processes like carbon cycle, nitrogen cycle, humus creation, among others. Most of the farmers have never had an opportunity to understand such agroecology processes on their farm (Khadse et al. 2017).

Subsequently, many such workshops were organized throughout Karnataka, including by local trainers. According to our interviews with ZBNF leaders, they estimate that possibly 200 workshops have been organized over the last 15 years to cater to farmers in the different districts of the state. The model was based on finding a team of local volunteer organizers-, who then locally mobilized resources from allies in order to organize such workshops. At the end of each workshop, accounts were announced in order to maintain transparency. *Mathas*<sup>8</sup> turned out to be important allies and often provided board and accommodation for free (Khadse et al. 2017).

Urban IT professionals turned into allies for the ZBNF movement, creating social media spaces for exchange, volunteering. We observe that today ZBNF has a strong social media presence. Facebook, Whatsapp, and such tools are frequently used by ZBNF farmers who have cell phones, and especially by youth for exchanges, troubleshooting or marketing.

At the global level, the farmers' alliance La Via Campesina (LVC) became a major ally of ZBNF through its local member – the Karnataka Rajya Raitha Sangha, many of whose farmers are ZBNF farmers. ZBNF became part of LVC's international work on agroecology and it was promoted as a successful case with a key role-played by farmers organizations including at the UN (La Via Campesina 2016). Several exchanges have been organized by Karnataka farmers for international farmers in India to learn about ZBNF (LVC South Asia 2015), while KRRS farmers that practice ZBNF are part of LVCs agroecology initiatives. ZBNF spread to Sri Lanka and Nepal through the efforts of LVC organizations there.<sup>9</sup>

Mier Y Terán et al. (2018) highlight the importance of allies in agroecology movements. In the case of ZBNF too, it was a string of allies that brought in a wide variety of resources towards the movement-either financial, board and housing, socio-organizational, volunteers, or cultural (in the form of art, music, or books on ZBNF).

Aside from these massive training camps, at the grassroots level training is done in a self-organized manner by local groups. Most districts in Karnataka have local ZBNF chapters which have their own schedules and styles of organization.

While Palekar's camp is essentially a top-down monologue with barely any time for interaction, the camp in itself presents an important networking opportunity for farmers. It is when they return and engage in farmer to farmer interactions in their locality where actual practical training takes place (Khadse et al. 2017). These are informal and ad-hoc in nature and are in line with constructivist teaching philosophies which often take the form of informal 'learning by doing' described by Mier Y Terán et al. (2018).

### ***Mobilizing discourse and charismatic leadership***

Many Indian political movements are formed around charismatic leaders and personality cults (Chitkara and Sharma 1997). In the ZBNF movement, Palekar's charisma has created a strong movement community and a bond with his followers who see him as their guru, ascribe godlike qualities to him, and are willing to make personal commitments upon his word; key characteristics of Weberian charismatic leadership (Abbasiyannejad et al. 2015). Not all ZBNF practitioners have such an exalted view of Palekar, but they see him as an important teacher. Van Seters and Field (1990) assert that charismatic leadership "must be visionary; it must transform those who see the vision, and give them a new and stronger sense of purpose and meaning". According to our interviews with several of ZBNF followers, a key reason for their taking up ZBNF is Palekar's vision and discourse and their ability to relate to it. Münster shows that in Wayanad, Kerala, farmers have a similar dedication to Palekar (Münster 2016). Critics point out that such a cult-like environment is dangerous as it does not create an atmosphere of debate or dissent.<sup>10</sup>

In our interviews with farmers, they claim that Palekar's explanations of these processes are straightforward and simple, and help them understand complex scientific concepts. Palekar uses what they call "farmers language", which is language adapted to farmers for popular education. Farmers collectively take vows at such events to make a shift away from debt (Münster 2016). Our survey among 97 farmers revealed that attending Palekar's workshops played a critical role in the majority of the respondent's shift towards ZBNF, what Mier Y Terán et al. (2018) refer to as mobilizing discourse, which is a driving factor in agroecology movements. According to an official in the AP government, this is the reason that the APZBNF program also organizes Palekar camps as a key tool to motivate farmers, even though their key pedagogical work happens at the village level through group approaches.

Palekar also discusses what he calls the spiritual philosophy of ZBNF, which is the basis of his other name for ZBNF-which is Zero Budget "spiritual" farming. Spirituality according to Palekar is Nature – "we see god through god's organs –

trees, plants, mountains, forests, rivers, birds' (32, Palekar 2005). His spiritual ideas are partially based in Gandhian thought of non-violence, self-reliance, and austerity which are commonly found among agroecology promoters in India (Brown 2018).

But some other elements of Palekar's discourse have generated controversy. He expresses a disdain for all things 'western,' but his idea of 'Indian-ness' is limited to elite Hindu ideals (Münster 2016). Palekar's discourse on spirituality professes the sacredness of the Indian cow. Academics warn that holding the cow as 'sacred', and other nativist tendencies that extoll Hinduism may unintentionally support chauvinist Right wing Hindu forces who are on the rise in India and have unleashed violence towards other non-Hindu minorities and Dalits that may consume beef.

Despite these criticisms, we note that Palekar has never made disrespectful statements about other religions in any of the several training camps we have attended. Palekar's popularity among farmers only seems to be growing, and dangers of such a discourse are lost on them. Many of his followers in Kerala are of Christian origin for example (Münster 2016). Allies like KRRS have a strong position against religious or caste discrimination.

### ***Simple farming practices***

With regard to the links between agroecological practices and the scaling up process, Rosset and Martínez-Torres. (2012) discuss the importance of farming practices that actually solve problems that farmers face to taking agroecology to scale. The Central American campesino-a-campesino movement points towards the advantage of implementing practices at a small scale and to start slowly for better adoption (Holt-Giménez 2001). Mier Y Terán et al. (2018) point out that simple practices may be important for early adoption. The experience of ZBNF also highlights that adoption improves if initial practices are simple and require less effort or resources to implement.

In interviews, farmers noted that ZBNF was often easier to adopt as compared to other alternative practices because it required relatively less effort and time and there were clear instructions provided by Palekar. For example, the creation of compost in an external pile or pit, commonly promoted in organic farming, requires large quantities of biomass, manure, and physical labor and requires a few weeks of time. On the other hand, the preparation of microbial mixtures in ZBNF, like *jivamruta*, took under three days and required less effort. Many of the practitioners that we interviewed were former organic farmers, disappointed because of its unaffordability (related to bio-inputs and certification), difficulty, and issues with commercialization. Münster reports the same for Kerala ZBNF farmers (2016).

## **Institutionalization of ZBNF – public policy in Andhra Pradesh**

According to our interviews with government officials in the neighboring state of Andhra Pradesh, ZBNF found a prominent ally around 2006. Vijay Kumar, a high ranking public official working on governmental poverty alleviation programs for women, introduced trainings on cost-cutting measures in farming via agroecology. He invited Palekar for various workshops sponsored by the state. This relationship subsequently led to ZBNF being adopted as a major state program in 2016.

Mier Y Terán et al. (2018) identify the adoption of public policy as a key political opportunity for agroecology to attain scale. Policies can take multiple forms and address complementary areas such as land reform, extension, government procurement, or marketing.

This program aims to cover six million farmers, by 2024–25 (APZBNF 2018). According to state officials, they hope this would be a tipping point in terms of reaching a critical mass that would sustain spontaneous movement-like adoption in the future. In the second year (2017–2018), the government of Andhra reports that 163,000 farmers adopted ZBNF at least partially on their farms in 972 villages.

### ***Group approaches in APZBNF***

The ZBNF program was built upon a previously successful state-led program on non-pesticide management, called Community Managed Sustainable Agriculture (CMSA). It helped to reduce pesticide usage in about 1.8 million acres and benefitted 738,000 farmers (Rao 2012). The unique feature of that program was that it worked with women organized into Self Help Groups (SHGs) and initiated a collective learning process via a Farmer Field School extension model (Vijay et al. 2009). The same model has now been replicated in the APZBNF program and gone beyond a focus on merely pesticide reduction to more holistic agroecological adoption.

Andhra already has extensive experience in group approaches and was a leader in the women's' Self Help Group movement in India (Deshmukh 2004). These programs targeted women from marginalized sections to engage in thrift and savings and were promoted as a tool for poverty alleviation and empowerment. They mainly became a channel to route micro-credit, as well as to find group solutions to problems like livelihood generation or health. Most of these SHGs, with 10–15 women each, have been federated at the village level to form Village Organizations and at district levels. Some of these federations have amassed significant capital, are linked to banks, and cater to the banking needs and other projects among their members. While there are mixed results on the impacts of these SHGs, they have provided an important experience in collective work and access to credit for many rural women in Andhra Pradesh and

expanded their economic opportunities. ZBNF has been introduced as one key activity for livelihood generation and food autonomy through these SHGs.

Mier Y Terán et al. (2018) identify the importance of social organization as a key driving factor in scaling up agroecology – it serves as the social fabric or the culture medium on which agroecology grows. In the case of Andhra's ZBNF policy (APZBNF), the social organizations of the SHGs became the foundation upon which the ZBNF program was initiated and replicated in the state.

The SHG federation banks provide credit to their members to initiate livelihood projects, including those under ZBNF – for example, to landless workers for land leasing. The SHGs are also the unit where group training and implementation of ZBNF takes place. The SHGs, in this case, are limited to group learning, access to inputs, machinery, credit, value addition and marketing but not to joint farming as is being practiced successfully and outperforming individual farming in Kerala's Kudumbashree model (Agarwal 2018).

### ***Farmer field school pedagogical approach***

Unlike most other mainstream agricultural extension programs, the AP ZBNF program is not a technology transmission model but a program where knowledge is extended through participatory social learning (Warner 2008). Farmers are trained by other farmer trainers called 'master farmers.' These are expert farmers who have already attained success in ZBNF practices, as well as receive training on horizontal extension and education methods. The master farmers provide handholding support to SHG members throughout their transition to ZBNF. They receive an honorarium from the state.

The Farmer Field school methodology was originally developed by the FAO to promote integrated pest management and brings farmers together in regular study circles to carry out collective observation, analysis and reflection about processes in their farm (LEISA 2003). Various authors point towards the importance of horizontal pedagogical methods in agroecology rather than top-down methods (Machín Rosset et al. 2011; Sosa et al. 2010). Mier Y Terán et al. (2018) highlight constructivist teaching–learning processes as a key driver of agroecology where a common objective is recognition of peasant knowledge and cultivation of peasant protagonism in place of conventional agricultural extension, in which peasants play a more passive role. A key benefit of this method is 'seeing is believing' (Machín Sosa et al. 2010), as farmers are more likely to believe another farmer who has already implemented the practices. Tensions can arise between constructivist learning and the reproduction of the top-down method; if the peasant promoter/master teacher behaves just as another top-down extension agent to impose rather than to facilitate, and by prescription, then the knowledge can get concentrated in the hands of a few farmers (Machín Sosa et al. 2010).

Such tensions also arise in the case of the AP ZBNF program, where one NGO representative involved in the program implementation pointed towards a tendency for meeting official targets. This, they worry, could lead to a dilution of learning processes and turn into a mere transmission of ZBNF practices, thus emulating a top-down approach.

According to our interviews with a number of master farmers and field observation, they have a full schedule of mandatory daily activities to ensure that they cover all the SHGs assigned to them. In the mornings, they organize a study circle in a specific village. In the afternoon, they visit farmers' fields for troubleshooting. In the evenings, they project videos related to the days learnings so that farmers can engage in discussions.

However, one criticism from sustainable agriculture experts that we have interviewed is that there is too much focus on a somewhat recipe style of transmission of practices. As the program is in its early stages of adoption, it seems logical that this may be the case, as simple practices are usually important for early adoption, whereas more complex practices that depend upon a more sophisticated understanding of ecological relationships at the farm and landscape levels advance at a slower pace (Mier Y Terán et al. 2018). One of our key observations of the farmer fields that we visited was that practices adopted by the farmers were at early stages, with a low level of sophistication, and mostly as a form of input substitution where *jiwamrita* was seen as another input. In comparison, ZBNF farms in Karnataka display a high level of integration, possibly because of the self-initiative and longer experience of farmers in the latter.

While input substitution strategies can prove attractive to farmers, Mier Y Terán et al. (2018) maintain that agroecology movements need to move beyond input substitution to benefit from synergistic interactions in more fully integrated agroecological systems. However, our interviews with master farmers reveal that it is not possible to start with high complexity concepts at the first go. They encourage farmers to experiment with ZBNF in a progressive manner, i.e. initially on a small portion of their land, on certain crops only, or limiting themselves to a selection of practices, which they say increases receptiveness. They felt that it was more important to get practical results first and then encourage complexity over the years. This is similar to the early steps in the “campesino to campesino” methodology in Latin America (Holt-Giménez 2006).

### ***Women, youth, and landless farmers***

The AP ZBNF program has, by design, a strong participation of women and a strategy for what they call ‘Poorest of the Poor’ (POP) category of landless farmers.<sup>11</sup> They also provide employment to educated rural youth as technicians in the program. This is unlike the ZBNF movement in Karnataka where, barring a few experiences, women are principally present as wives

of men farmers (Khadse et al. 2017) and landless farmers are absent. Mier Y Terán et al. (2018) point towards the need for a deeper understanding of womens' participation in agroecology, and highlight the various roles they have played in emblematic cases of agroecology. However, we agree with feminist scholars and gender activists who have pointed out that beyond highlighting women's participation in agroecology, it is important to ask how agroecology has increased opportunities for better gender relations (Mcmahon 2004).

In the case of the AP ZBNF program, we note that there was a strong presence and spaces for women. Almost half of the master farmer trainers were women farmers, who were also teaching men farmers. Moreover, the program started out with women's SHG groups and later created men's SHGs modeled on the former. The state also has initiatives like custom rental centers for group renting of small machinery to reduce women's drudgery, and Non-Pesticide Shops, which sell botanicals and cow-based formulations and are mostly run by women or landless families as an additional livelihood strategy. At the same time, the state has supported the women's SHGs with subsidized credit linkages with banks.

In literature on collective enterprises, there is support for the idea that group approaches have positive effects for resource-poor women, especially when they are from a homogenous social background (i.e. caste or class) which prevent the reproduction of social inequalities (Agarwal 2010). In our interviews with women farmers in AP, they stated they felt more confidence, solidarity, and learning. Most of them did not have land titles and were never traditionally part of any state extension service. The SHGs and ZBNF combination is making agriculture extension work more positive for them. Many SHGs had initiated projects related to health, violence against women, and income generation, and now ZBNF is a new source of additional income and food security for their families. The formation of men SHGs for ZBNF, said one woman farmer, had increased her husband's receptiveness for her group work. These are preliminary observations however and much more detailed study needs to go into the intricacies of such group work and impacts on women at the household level. The question of women's land ownership is a critical one that this policy approach does not address.

Youth have not been central to many successful scaling up cases reported in the academic literature, though anecdotal evidence suggests that they are (Mier Y Terán et al. 2018). Peasant movements active in agroecology have been emphasizing the importance of youth leadership (La Via Campesina 2017). The AP ZBNF program has hired 150 youth farmer fellows; with more added every year through a screening process. These are mostly rural students with an agriculture degree who join the program and assist master farmers in their work, while learning to practice ZBNF on leased land to supplement the honorarium provided by the state. According to our

interviews with a number of Natural Farming Fellows, most were looking to migrate to the city or for jobs, but ZBNF provided them an opportunity to work on interesting social projects in the countryside and earn an income. A majority of the youth, despite an agriculture degree, were learning about agroecology for the first time and had previously focused purely on mainstream input oriented chemical farming. Although the number of youth hired is quite small and limited to youth from educated elite backgrounds, this could be an interesting model to include rural youth in relevant sustainable development programs in rural areas. However, more livelihood opportunities need to be created for many of the rural youth from poorer families and to prevent forced migration.

The POP strategy of the government aims to target landless workers SHGs to turn them into 'net food producers' by leasing half an acre of land and grow food crops for household consumption. There is a half-acre POP model which consists of paddy, which is a staple food crop for the household, and other vegetables, which aim to provide about 725 USD per year per family of additional income through marketable surplus. The village federations of the SHGs have been given a fund of 14 million USD by the Rural Development department to lease 5000 acres of land for 10,000 landless farmers to practice ZBNF (APZBNF 2018). We interviewed at least five POP landless women who had obtained a loan from their SHGs for initial investment and land leasing and had repaid the loan. Some also worked in the government's work program called MNREGA. Group approaches towards land-pooling and collective production could yield greater benefits for landless families where appropriate (Agarwal 2018).

### ***Controversial partnerships***

AP has raised funds from both the central Indian government as well as private philanthropy and on its website claims that its first preference is governmental funds. In India, it has partnered with the fund of the philanthropist Azim Premji, who has given 72 million USD. Globally, it has recently signed agreements with organizations like the German bank KfW, and the UNEPs Sustainable India Finance Facility, which includes the European bank BNP Paribas which are pledging two billion USD raised from climate bonds for the future scaling up of ZBNF across the state.

Indian activists have raised an alarm over transparency and the involvement of global financial entities in AP ZBNF which poses a contradiction for ZBNF as it promotes autonomy and aversion to global capital (Palekar 2005; Saldanha 2018). As a result of some questioning, the AP government provided agreements on its website making a positive move towards transparency, yet a key concern remains as to the food sovereignty and autonomy of AP as well as how the loans and interests will be paid back without a commercialization of the sector.

Another concern is the establishment of a massive seed park with support of the Bill and Melinda Gates Foundation which has openly supported transgenics and gene editing technology elsewhere (Holt-Giménez, Altieri, and Rosset 2006; Saldanha 2018). It is contradictory for the state to enter such an agreement when it claims to promote ZBNF which shuns transgenics and claims to promote solely local seeds.

Agroecology advocates have expressed concerns about the rising interest of transnational corporations in agroecology. These could empty agroecology of its meaning by greenwashing, producing commodities instead of food, proprietary inputs and seeds, leading to a loss of autonomy for peasants, among others (Giraldo and Rosset 2017). Similar concerns apply to the entities in the APZBNF program. All these questions pose a contradiction for ZBNF-on the one hand, it strives to create autonomy, especially from global capital, but on the other, it is entering into agreements with the very institutions that are part of the hegemonic order of capital.

As in other agroecology policy initiatives such as Brazil, APZBNF does not threaten mainstream agriculture but rather exists alongside – there is incoherence among policies (Mier Y Terán et al. 2018). AP has established many new chemical fertilizer factories (Hans India 2016) and has a fertilizer bill of 860 million USD (Jonathan 2018). Similarly, the NitiAyog, India's major policy think tank, has now been verbally promoting ZBNF for national adoption, while at the same time recommending GMOs (Saldanha 2018).

## Challenges ahead

### *Inclusivity*

Organic activists are concerned about Palekar's unreasonable aversion to the organic farming label (Palekar, n.d.). They also oppose what they call an exclusive promotion of the label ZBNF by the state without any scientific evidence to support the method, while ignoring other methods like biodynamic farming, permaculture, organic farming, etc. (Saldanha 2018). At the same time, Niti Ayog's rhetorical promotion of ZBNF is also of concern to them as it could exclude work done by organic promoters.

La Via Campesina, a major global proponent of peasant agroecology, highlights the importance of 'dialogue of knowledge' (*dialogo de saberes*) between different actors in order to strengthen agroecological knowledge and movement (Martínez-Torres and Rosset 2014). While we agree that ZBNF must not discriminate against other practices we are not convinced that the question of labels is really crucial. LVC has argued that rather than worrying about the name given to any particular approach, we should be more concerned about the principles behind it (La Via Campesina 2013). Most of the approaches mentioned are largely based on the same agroecological principles, and APZBNF, in

its package of practices, is actually promoting a host of agroecological practices that are not strictly 'ZBNF'. Other new states like Himachal who have recently started to promote ZBNF do it closely in line with organic farming (Govt of Himachal Pradesh 2018). We are also concerned about the 'lack of evidence' arguments, as they sound a lot like those used by agribusiness advocates to discredit agroecological approaches (Rosset and Altieri 2017). ZBNF has arguably been popularly accepted by farmers and farmers movements at a large scale over quite some time. However, we do agree that ZBNF does face a challenge if it is not able to show inclusivity to and work with other forms of agroecology.

### ***State dependencies***

Related to the largely paid support system for ZBNF in the state, Mier Y Terán et al. (2018) raise a concern that state support could create dependencies over time. For instance, in Brazil, the cutback of policies that supported public acquisition from peasant cooperatives and incipient agro-industrial projects for family farmers suffered when the policies were cut back (Oliveira and Baccarin 2016). We find that a lot of state focus is on the ZBNF policy, while ignoring support for grassroots social movement efforts as in Karnataka. A concern remains as to what will happen once funding ends. However, we do note that the AP program engages more in building people's institutions, social organization, and collective capacities, which we believe can have long-term impacts.

### ***Commodification***

The threat of international financial institutions, as well as the UN Environment Program's verbal promotion of exports of natural commodities from APZBNF, could lead to increasing commercialization of the food sector (Saldanha 2018). While the AP government had not made any particular exporting efforts at the time of writing this paper, there were plans to establish Farmers Producer Organizations (FPOS)<sup>12</sup> by the federations of SHGs which would have the autonomy to engage with markets- national or international. The establishment of voluntary collective marketing entities for small farmers like FPOs has been a key demand of many farmers movements (AIKSCC 2017), but activists are concerned that an export regime could come in because of stringent certification demands. While these concerns are valid, it is too early to comment on them as such developments have not yet taken place. At the moment, APZBNF is engaging in Participatory Guarantee System certification and local markets. Export markets bring threats like rigid certification requirements, focus on export crops, and export dependence (Münster 2016). Export markets are playing a key role in many of India's state-led organic initiatives like in Sikkim and Kerala (Kumar, Pradhan, and Singh 2018; Thottathil 2012). Many largescale

agroecological transitions like organic coffee in southern Mexico, or Brazil's organic cooperatives were supported by export markets but Mier Y Terán et al. (2018) point out that agroecological scaling that is based purely on market opportunities can be vulnerable to external market logic. Market mechanisms should strengthen social movement initiatives rather than become a central driving force. In AP, many positive examples of collective marketing exist such as Deccan Development Society and Timbaktu Collective which could show the way (Deccan Development Society 2016; Kothari 2014). A challenge for APZBNF will lie in incentivizing local food sovereignty even as export opportunities open up.

## Conclusion

ZBNF is attaining wide scale in India among more and more farm families—initially as a farmer-led social movement, and more recently with the adoption of a significant public policy in the state of Andhra Pradesh. Other state governments like Himachal Pradesh and Kerala are also initiating pilot programs in line with Andhra's experience. In both cases, its wide reach has been triggered by a number of factors identified by Mier Y Terán et al. (2018) as important for the scaling up of any agroecology process. These are (1) the farm crisis in India which has led to a receptiveness for alternatives; (2) the social organization of farmers movements in Karnataka, and Self Help Groups in Andhra Pradesh; (3) horizontal teaching–learning processes; (4) simplicity of ZBNF practices; (5) mobilizing discourse; (6) external allies; (7) political opportunities in the form of key allies inside government and favorable public policies. The role of marketing efforts like collective and nested markets has also been identified by Mier Y Terán et al. (2018) as playing a key role. While we have not seen that such efforts have played an important role in the case of ZBNF, there is ample potential to develop solidarity based group marketing to scale up ZBNF in India.

Andhra Pradesh's state policy has created an apparently positive state-led model which supports local horizontal and collective learning processes with leadership of women. Their model has inspired other states to commit resources and political will to implement ZBNF. Policy support is a welcome move and important in order to move from 'islands of success' to massive adoption (Gregory, Plahe, and Cockfield 2017). It remains to be seen how these upcoming state interventions will unfold over time and a more detailed investigation is needed about their results and implementation.

While policy interest in ZBNF is being celebrated, there is also a need for caution, especially as states try to mobilize funding for their policies. In the case of Andhra, significant resources are being mobilized from international banks. The participation of such entities could threaten the

values of autonomy and independence from capital professed by the ZBNF movement.

## Notes

1. It should be said, however, that in our interviews with other sustainable agriculture activists in India, many noted that they have found it difficult to align with the ZBNF movement because of Palekar's intolerance for other sustainable agriculture, practices especially 'organic' farming which he calls an extension of the corporate food regime Palekar, S. n d. However, he has grouped even small-scale agroecological farmers, who may identify with the organic label with industry-led organic, and thus rejects organic. This has offended many organic farming activists and prevented alliances with other movements. However, we note that farmers have an approach that is more pragmatic than organic rules, choosing the practices that work best for them.
2. Fieldwork for this paper was conducted from 2012–2015 in Karnataka and more recently in 2017 and 2018 in Andhra Pradesh.
3. Sanskrit for abundant.
4. Palekar training camp, Guntur 2018.
5. NADEP is a type of composting method created by an Indian farmer. It speeds up the composting process and provides much larger quantities of compost as compared to normal composting systems.
6. Interview with ZBNF farmer, Krishnappa.
7. Interviews with ZBNF leaders.
8. Mathas are Hindu monastic institutions. Mostly found in a few states like Karnataka, mathas are politically powerful religious institutions and an integral part of the social fabric. They have a long history of carrying out social programs.
9. No research has been conducted on ZBNFs adoption in these countries so far.
10. Interview with member of sustainable agriculture movement in India.
11. The ZBNF program has been linked up with other national programs targeting women and POP – such as the government's Mahila Kisan Sashaktikaran Pariyojana – a program targeting women farmers from poor households.
12. A farmers' collective under the Companies Act of India- a producer company is a hybrid between a private limited company and a cooperative society.

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## References

Abbasiyannejad, M., A. D. Silong, I. A. Ismail, J. Othman, N. Wahiza, and A. Wahat. 2015. Charismatic leadership and society. *International Research Journal of Social Sciences*, 4(1), 68–73.

Adhikari, Prabhakar, Hailu Araya, Gerald Aruna, Arun Balamatti, Soumik Banerjee, P. Baskaran, B. C. Barah, et al. 2018. System of crop intensification for more productive, resource-conserving, climate-resilient, and sustainable agriculture: Experience with diverse crops in varying agroecologies. *International Journal of Agricultural Sustainability* 16 (1). Taylor & Francis: 1–28. doi:10.1080/14735903.2017.1402504.

Agarwal, B. 2010. Rethinking agricultural production collectivities. *Economic & Political Weekly*, xlv (9), 64–78.

Agarwal, B. 2018. Can group farms outperform individual family farms? Empirical insights from India. *World Development* 108:57–73. doi:10.1016/j.worlddev.2018.03.010.

AIKSCC. 2017. Demands of all India Kisan Sangharsh coordination committee. <http://Aiksc.com>. <http://aiksc.com/demands/>.

Altieri, M., and C. Nicholls. 2008. Scaling up agroecological approaches for food sovereignty in Latin America. *Development* 51:472–80. doi:10.1057/dev.2008.68.

Altieri, Miguel A. 2018. *Agroecology: The Science of Sustainable Agriculture*, Second Edition. doi: 10.1201/9780429495465.

Amareswari, P. U., and P. Sujathamma. 2014. Jeevamrutha as an alternative of chemical fertilizers in rice production. *Agricultural Science Digest - A Research Journal* 34 (3):240. doi:10.5958/0976-0547.2014.01012.X.

APZBNF. 2018. Zero budget natural farming. <Http://Apzbnf.in/Faq/>. <http://apzbnf.in/faq/>.

ASHA. 2015. Ecological agriculture in India: Scientific Evidence on Positive Impacts. [www.kisanswaraj.in](http://www.kisanswaraj.in).

Balaraju, B., H. Tripathi, and J. Yadav. 2017. Reasons for Decreasing Indigenous Cattle Population and Interventions in its Conservation: A perceptual study of field veterinarians in Karnataka. *International Journal of Livestock Research* 7 (12).

BNNMurali. 2016. Zbnf Layout Plans. <https://agricultureforbetterfarming.wordpress.com/2016/07/04/zbnf-plants-planting-layout-plans-2016/>.

Brown, Trent. 2018. *Farmers, Subalterns, and activists : social politics of sustainable agriculture in India*. New Delhi: Cambridge University Press.

Chitkara, M. G., and B. R. Sharma. 1997. *Indian republic: Issues and perspective*. New Delhi: Ashish Publishing House.

Deccan Development Society. 2016. Community controlled public distribution system: Experiences from Andhra Pradesh. Accessed November 2. <http://ddsindia.com/PDF/Community PDS.pdf>.

Deshmukh, J. 2004. Women's self-help groups in Andhra Pradesh: Participatory poverty alleviation in action. *Info.Worldbank.Org*. <http://info.worldbank.org/etools/docs/reducingpoverty/case/82/fullcase/India SHGS Full Case.pdf>.

Giraldo, O. F., and P. M. Rosset. 2017. Agroecology as a territory in dispute: Between institutionality and social movements. *The Journal of Peasant Studies* 45 (3):545–64. doi:10.1080/03066150.2017.1353496.

Govt of Himachal Pradesh. 2018. Himachal Pradesh government notification. <http://www.hillagric.ac.in/aboutus/registrar/pdf/2018/GA/30.05.2018/GA-30.05.2018-24882-98-29.05.2018.pdf>.

Gregory, L., J. Plahe, and S. Cockfield. 2017. The marginalisation and resurgence of traditional knowledge systems in India: Agro-Ecological 'Islands of Success' or a wave of change? *South Asia: Journal of South Asian Studies* 40 (3):582–99. doi:10.1080/00856401.2017.1336686.

Holt-Giménez, E. 2001. Scaling up sustainable agriculture lessons from the campesino a campesino movement. *LEISA Magazine*. October 2001: 27–29.

Holt-Giménez, E. 2006. *Campesino a campesino. Voices from Latin America's farmer to farmer movement for sustainable Agriculture*. 1st ed. Oakland, CA: Food First Books.

Holt-Giménez, E., M. A. Altieri, and P. Rosset. 2006. Ten reasons why the Rockefeller and the Bill and Melinda Gates foundations' alliance for another green revolution will not solve the problems of poverty and hunger in Sub-Saharan Africa. [www.foodfirst.org](http://www.foodfirst.org).

India, H. 2016. AP Inks 10k Cr fertilizer plant deal with chinese firms. [Http://Www.Thehansindia.Com](http://www.Thehansindia.Com). <http://www.thehansindia.com/posts/index/Andhra-Pradesh/2016-06-28/AP-inks-10k-cr-fertilizer-plant-deal-with-Chinese-firms/238133>.

Jonathan, S. 2018. Natural farming is the only way out, says expert. *The Hindu*. <https://www.thehindu.com/todays-paper/tp-national/tp-andhrapradesh/natural-farming-is-the-only-way-out-says-expert/article24092671.ece>.

Khadse, A., P. Rosset, H. Morales, and B. G. Ferguson. 2017. Taking agroecology to scale: the Zero Budget Natural Farming peasant movement in Karnataka, India. *The Journal of Peasant Studies*, 1–28.

Kothari, A. 2014. Very much on the map: The Timbaktu collective." [http://kalpavriksh.org/images/alternatives/CaseStudies/Timbaktu\\_Collective\\_Case\\_study\\_report\\_20Mar2014.pdf](http://kalpavriksh.org/images/alternatives/CaseStudies/Timbaktu_Collective_Case_study_report_20Mar2014.pdf).

Kumar, J., M. Pradhan, and N. Singh. 2018. Sustainable organic farming in Sikkim: An inclusive perspective. In: S. SenGupta, Z. AS, K. Sherpa, and A. Bhoi, (eds). *Advances in Smart Grid and Renewable Energy. Lecture Notes in Electrical Engineering*, (pp. 367–78). Singapore: Springer.

La Via Campesina. 2013. From Maputo to Jakarta: 5 years of agroecology in La Via Campesina. Jakarta.

La Via Campesina. 2016. Zero budget natural farming in India. *Family Farming Knowledge Platform of FAO*. <http://www.fao.org/family-farming/detail/en/c/429762/>.

La Via Campesina. 2017. VIIth International Conference, La Via Campesina: Euskal herria declaration - Via Campesina. *Www.Viacampesina.Org*. <https://viacampesina.org/en/viith-international-conference-la-via-campesina-euskal-herria-declaration/>.

La Via Campesina South Asia. 2015. Call for participation in international agroecology training at Amritha Bhoomi (India) October 28-Nov 5. *Lvcsouthasia.Blogspot.In*. <http://bit.ly/1tk0MdX>.

LEISA. 2003. Learning with farmer field schools — AgriCultures network." <http://www.agriculturesnetwork.org/magazines/global/learning-with-farmer-field-schools>.

Martínez-Torres, M.E., and P. Rosset. 2014. Diálogo de saberes in La Vía Campesina: Food sovereignty and agroecology . *Journal of Peasant Studies* 41 (6):979–97.

Mcmahon, M. 2004. Gender and organic agriculture: A local and partisan position. *First Annual Conference for Social Research in Organic Agriculture*, Guelph, Ontario.

Mier y Terán, M., O. F. Giraldo, M. Aldasoro, H. Morales, B. G. Ferguson, P. Rosset, A. Khadse, and C. Campos. 2018. Bringing agroecology to scaKey drivers and emblematic cases. *Agroecology and Sustainable Food Systems* 42 (6):637–65. Taylor & Francis. doi:[10.1080/21683565.2018.1443313](https://doi.org/10.1080/21683565.2018.1443313).

Münster, D. 2016. Agro-Ecological double movements? Zero budget natural farming and alternative agricultures after the neoliberal crisis in Kerala. In *Critical perspectives on agrarian transition: India in the global debate*, ed. B. B. Mohanty, 222–44. India: Routledge.

Nicholls, C.I., and M. A. Altieri. 2018. Pathways for the amplification of agroecology. *Agroecology and Sustainable Food Systems*, 42 (10): 1170–93.

NSSO. 2014. *Key indicators of situation of agricultural households in India*. National Sample Survey Office, Government of India.

Oliveira, J. A., and J. G. Baccarin. 2016. Organização Espacial e Execução Do Programa de Aquisição de Alimentos Da Agricultura Familiar Entre 2003–2012. *Revista Equador* 5 (2):120–38.

Palekar, S. 2005. *The philosophy of spiritual farming I*. 2nd ed. Amravati: Zero Budget Natural Farming Research, Development & Extension Movement, Amravati, Maharashtra, India.

Palekar, S. 2006. *The principles of spiritual farming II*. 2nd ed. Amravati: Zero Budget Natural Farming Research, Development & Extension Movement, Amravati, Maharashtra, India. <http://www.vedicbooks.net/principles-spiritual-farming-volume-p-14779.html>.

Palekar, S. n.d. *Is organic farming a conspiracy*. Amravati: Zero Budget Spritual Farming Research, Development and Extension Movement. <https://es.scribd.com/doc/141781151/subash-palekar-book-list>.

Parmentier, S. 2014. *Scaling-up agroecological approaches: What, why and how?* Belgium: Oxfam Solidarity.

Rao, G.B. 2012. *Current climate variability in Andhra Pradesh and adaptation options available*. Hyderabad: Food and Agriculture Organization and Global Environmental Facility.

Rosset, P., B. M. Sosa, A. M. R. Jaime, and D. R. Á. Lozano. 2011. The campesino-to-campesino agroecology movement of ANAP in Cuba: Social process methodology in the construction of sustainable peasant agriculture and food sovereignty. *The Journal of Peasant Studies* 38 (1):161–91. doi:10.1080/03066150.2010.538584.

Rosset, P., and M. E. Martínez-Torres. 2012. Rural social movements and agroecology: Context, theory, and process. *Ecology and Society* 17 (3):17. doi:10.5751/ES-05000-170317.

Rosset, P., and M.A. Altieri. 2017. *Agroecology : science and politics*. Manitoba: Fernwood publishing.

Saldanha, L. F. 2018. A review of Andhra Pradesh's climate resilient zero budget natural farming programme. <http://www.esgindia.org/sites/default/files/education/community-outreach/press/crzbnf-review-saldanha-esg-oct-2018.pdf>.

Satishkumar, M., and K. B. Umesh. 2018. Farmers strategies to cope labour shortage in northern and southern dry zones of Karnataka, India. *Current Agriculture Research Journal* 6 (2):206–12. doi:10.12944/CARJ.6.2.10.

Sosa, M., A. Braulio, M. R. Jaime, D. R. Á. Lozano, and P. Rosset. 2010. *Revolución Agroecológica: El Movimiento de Campesino a Campesino de La ANAP*. Havana: ANAP and La Via Campesina.

Sreenivasa, M. N., Nagaraj Naik, and S. N. Bhat. 2009. "Beejamrutha: A Source for Beneficial Bacteria." *Karnataka Journal of Agricultural Sciences* 22 (5). University of Agricultural Sciences: 1038–40.

Thottathil, S. E. 2012. Ncredible Kerala? A political ecological analysis of organic agriculture. <https://escholarship.org/uc/item/6vc7m7ht>.

Van Seters, D. A., and R. H. G. Field. 1990. The evolution of leadership theory. *Journal of Organizational Change Management* 3 (3):29–45. doi:10.1108/09534819010142139.

Varghese, S., and K. Hansen-Kuhn. 2013. Scaling Up agroecology. Towards the realization of the right to food. Institute for Agriculture and Trade Policy.

Via Campesina, La. 2016. "Zero Budget Natural Farming in India." *Family Farming Knowledge Platform of Fao*. [Http://www.fao.org/family-farming/detail/en/c/429762/](http://www.fao.org/family-farming/detail/en/c/429762/)

Vijay, K. T., P. Shah, D. V. Smriti Lakhey, J. K. Raidu, V. Kalavakonda, and M. Pillai. 2009. *Ecologically sound, economically viable : Community managed sustainable agriculture in Andhra Pradesh, India*. Washington D.C.: The World Bank.

Warner, K. D. 2008. Agroecology as participatory science. *Science, Technology, & Human Values* 33 (6):754–77. SAGE PublicationsSage CA: Los Angeles, CA. doi:10.1177/0162243907309851.

Wezel, A., S. Bellon, T. Doré, C. Francis, D. Vallod, and C. David. 2009. Agroecology as a science, a movement and a practice. A review. *Agronomy for Sustainable Development* 29:503–15. doi:10.1051/agro/2009004.

Wijeratna, A. 2018. Agroecology Scaling Up, Scaling Out. Action Aid.