

INDIA'S SPACE MISSION

The Indian government's vision for space exploration and development outlined here is ambitious and multifaceted, with significant implications for both India's technological advancement and its geopolitical standing.

Building an indigenous space station signifies India's capability to independently undertake complex space missions. This move not only enhances India's prestige in the global space community but also opens up opportunities for international collaboration and scientific research. Additionally, it fosters domestic expertise and creates high-skilled jobs in the space sector. Setting a timeline for landing an Indian astronaut on the Moon and outlining a comprehensive roadmap for lunar exploration demonstrates India's long-term commitment to space exploration. By developing next-generation launch vehicles, infrastructure, and technologies, India aims to secure a significant role in future lunar missions. Success in lunar exploration could unlock valuable resources and scientific knowledge, further boosting India's space capabilities.

Venturing into interplanetary missions, such as orbiting Venus and landing on Mars, underscores India's aspiration to explore beyond Earth's immediate vicinity. These missions not only push the boundaries of scientific knowledge but also position India as a key player in planetary exploration. Success in interplanetary missions could elevate India's status in the global space arena and inspire future generations of scientists and engineers.

India's Unfolding National Security Makeover

■ LT GEN RAJ SHUKLA (RETIRED)

In the ten years of its existence, the Modi government has laid a strong foundation for India's National Security Makeover. We are in the midst of the most far-reaching reforms in Defence and National Security since Independence. While a great deal has been achieved, given the enormity (China) and complexity (technological innovation that is driving the most fundamental change in the Character of War in recorded history) of the Challenge, there are multiple transitions still to be made. So some honest stocktaking may be useful.

The Grand Strategic geometry was laid out by the Prime Minister himself, in his address to the Combined Commanders in December 2015, one remarkable for its breadth of vision and clarity of purpose - it laid out the road map for our evolutionary strategic outlook, structural reforms, technological revamp, cultural transitions, and capacity upgrades to include power projection. So ambitious was the sketch that there were deep misgivings about delivery - after all, many such initiatives in the past had turned out to be stillborn.

This time however, the reforms have unfolded in precise tranches, with unfailing regularity and dogged resolve.

It all began with the creation of the CDS/DMA, a path breaking move, even more powerful in conception and sweep, than the American Barry Goldwater Nichols. It corrected a major anomaly in India's Civil - Military Relations (CMR) frame, returning to the Defence Services their legitimate voice in strategic-military affairs. It exhorts them to think for themselves and drive the much-needed change in the national security frame, of course under robust political oversight. Quite unprecedented.

We have seen a new normal in the nation's strategic outlook, symbolised by the Balakote & Kailash Range operations. In swift strikes we signalled to our adversaries, what would have taken months of tortuous diplomacy to convey likewise: there will be costs to pay for adventurism of any sort. As a consequence of a major military re-balancing to the North (LAC with China), our defence posture now is a more accurate reflection of the threat.

The drivers of Aatmanirbharta in Defence initiative, go far beyond the critical objective of self - reliance. It is an ambitious venture to usher in a new culture of innovation, energy and enterprise, an invite to talents from the world of science and technology, business and enterprise in India to come together, to create defence capacities and supply chain resiliencies for the future. Enabled by IDEX, Indian start-ups like 114ai, 3rditech and New Space have shown the potential to scale up and grow into 'National Champions' of the future. Elon Musk has demonstrated that even in high end national security ventures like space, what were once country things are now fast becoming company things. So, the speed with which private sector competencies / start up energies are integrated into capacity building and war fighting will determine the power of the Indian military of the future. While the Corporatisation of the OFB was long overdue, the DRDO Reforms are simply breathtaking. Cumulatively, the sustained initiatives are an expression of India's resolve to become a Global Innovation Hub as also a Defence Powerhouse - if out of the top twenty defence Corporate Majors in the world, seven are Chinese, why should India not have similar aspirations? The Defence Services have evolved a broad consensus on the contentious issue of Theatre Commands and are now addressing the nitty gritty of implementation - so Theatre Commands will happen soon. A Joint Culture is being invigorated. Even more significantly, the process of unlocking of data, structuring digital pipelines and embracing a penumbra of technologies to lay the foundation of an AI Enabled Military with multi-domain capacities has begun. The latter is a humongous challenge-development of Large Language Models (LLMs), compute capacities, clouds, coders and algorithms across all the grids of war fighting, will need great creativity - it will be however, the secret sauce for our Asymmetric Addressal of China. The ORF driven, Annual Raisin a Dialogue, has grown into this fount of deep conversations in foreign policy. Recently, the Indian Army hosted the first ever Indo-Pacific Army Chiefs' Conference, a global gathering of Chiefs of Armies. The Chanakya Defence Dialogue and the Global Technology Summit, soon thereafter, completed the circle. New Delhi now is coming into its own as this global epicentre for comprehensive ideation in National Security. While in laying the edifice for the makeover, many mountains have been moved, higher peaks still need to be scaled.

China is the first of those peaks. What makes the China Challenge worrying, is that it is sophisticated and laced with strategic cunning - it goes beyond mere operational rebalancing: not only the capacity blitzkrieg in the WTC but the embrace of digital combat and its signature projects like the Rocket and Strategic Support Forces. We need to move fast to address these lags in our strategic deterrence.

There are other challenges as well, namely, addressing the lessons coming out of the recent conflicts around the globe, like the power of asymmetry and the magic of precision. Houthi missiles at an outlay of 5 million dollars are overwhelming American air defences worth 250 million dollars. Low cost Shehzad loiter munitions coming out of Tatarastan are wreaking havoc in Ukraine with telling accuracy. Innovation cycles are now delivering in six months what traditional procurement cycles will take over six years. We still have a long way to go; it is not a done deal as of yet. While 'Vasudhaiva Kutumbakam' must remain the guiding light of our engagement with the world, we must pay equal heed to the wise words of Swami Vivekanand-"the world is but agymnasium where nations come to make themselves strong."Peace through strength' must be our credo.

Humility is not cowardice. Meekness is not weakness. Humility and meekness are indeed spiritual powers.

-Swami Sivananda

Zero Budget Natural Farming (ZBNF)-Highly Profitable for Small Farmers

■ DR. RAMA KANT SHARMA

Zero Budget Farming is a variation on natural farming developed in, and primarily practiced in southern India. It also called spiritual farming. The method involves mulching, intercropping, and the use of several preparations which include cow dung. These preparations, generated on-site, are central to the practice, and said to promote microbe and earthworm activity in the soil.

All inputs are to be locally sourced from in and around the village (or perhaps within the farm) in a symbiotic way. This is a dynamic system wherein outputs are likely to be inputs to at least one of the other outputs. More importantly, as none of, the inputs are sourced from outside the system then there is no cost, and it is this that is referred to as zero budget natural farming (ZBNF). The logic of the system is simple. If rainforests can have lush growth and also sustain animals then why cannot we propagate agriculture through lessons from nature without recourse to any chemicals and fertilizers. A call to nature where no external inputs need to be purchased is referred to as zero budget natural farming or naisargik khethi or jaivik khethi.

ZBNF is an agro ecological farming approach that promotes growing crops in harmony with nature. The toolkit of ZBNF was developed by 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 agro ecological principles, including diversification, nutrient recycling, increasing beneficial biological interactions, among others (Palekar2006). 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 (sense Rosset and Martinez-Torres. 2012).

Need for ZBNF

Ensuring food security and producing more with less resources.

For building the resilience of smallholder farmers for creating a food-secure future.

ZBNF is the right solution to fight climate change and create resilient food systems.

Fighting drought is one of the main objectives of ZBNF.

The Food and Agriculture Organization (FAO) of the UN advocates environmentally-friendly

farming methods that can take us to a more sustainable future.

Importance for chemical free food consumption is growing rapidly.

Chemical farming has made food a poison and also has reduced the yield by making lands barren.

Farmers' welfare and sustainable practices are vital for a sustainable and productive economy.

Features of ZBNF

It is a farming practice that believes in natural growth of crops without adding any chemical fertilizers and pesticides.

The four wheels of ZBNF are Bijamrita, Jivamrita, Mulching and Waaphasa.

Bijamrita is a natural way of seed treatment using local cow urine and cow dung. Jivamrita is made using water, local cow dung, local cow urine, jaggery, dal flour and soil.

Waaphasa is the aeration in the soil.

ZBNF is different from organic fanning. Inter cropping is an important feature of ZBNF.

Practicing composting on the farm itself, so that soil organic matter increases.

Storing water in the farm ponds for use in adverse conditions.

Insects and pests are managed using neem leaves, neem pulp and green chilies.

Establishing farmers' federations and self-help groups, and placing farmers at the forefront of knowledge creation and dissemination.

Four pillars of ZBNF

Jeevamrutha/Jivamrita:

This is a fermented microbial culture prepared from locally available natural resources for the purpose of being applied to the soils/plants at different stages of their growth. It is a form of bio-fertilizer, a catalytic agent, promoting microorganism and earthworm activity in the soil. The 48 hour fermentation process multiplies aerobic and anaerobic bacteria present in the cow dung and urine, as they eat up organic ingredients, and a handful of undisturbed soil acts as inoculate of native species of microbes and organisms. Its application acts as a preventive measure against fungal and bacterial diseases. It can be applied through irrigation water or through foliar spray. While transiting from conventional input-intensive agriculture, the application of Jeevamrutha to the soils and plants is required only for the first three years because after that the system becomes self-sustaining.

Beejamrutha/Bijamrita:

This is a concoction prepared from locally available natural resources for the propose of treatment for seeds, seedlings or any planting material. It reduces the possibility of seed infestation by pests and protects young roots from fungus, soil-borne diseases, and seed-borne diseases that generally affect the plants after monsoon. In the ingredients, the dung and urine from the indigenous breed cow act as a powerful fungicide, and anti-bacterial agent, respectively.

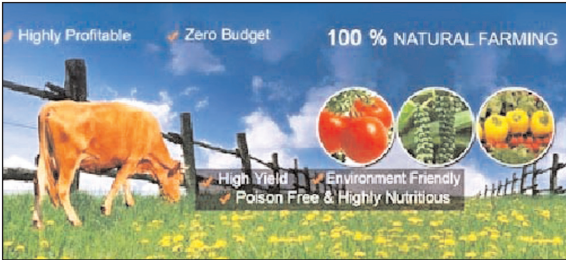
Aechadana/Mulching:

There are three types of mulching

"Soil mulching: It protects topsoil by avoiding tilling. It facilitates aeration, and promotes water retention. If not zero tillage, avoid deep ploughing.

"Straw/Biomass mulching: Application of dry organic matter (dead material of any living being) along with Jeevamrutha will lend to decomposition and humus formation that will improve soil fertility.

"Live mulching: This suggests inter-cropping or mixed-cropping by combining monocots



(those seedlings with one seed leaf like rice and wheat) with dicots (these seedlings with two seed leaves like legumes) in the same plot of land. This will create a symbiotic relationship because monocots will supply elements like potash, phosphate, and sulphur, while dicots will work towards nitrogen-fixation.

Whapasa/Moisture:

This calls for an appropriate mix of water and air in the soil or the relevance of soil moisture. It questions the thinking that plants need more water and irrigation is the way out. Rather, it calls for a reduction in water usage and resonates with the saying "more crop per drop."

Methodology

S. No	Methods	Preparation	Benefits
1	Jivamrita/ Jeevamrutha	It is composed of the cow dung (20 Kg), urine (5-10 l), jiggery (20 kg) and dicot flour (2 kg) and is applied to the crops with each Irrigation cycle OR directly to the crops.	It provides nutrients, but most importantly, acts as a catalytic agent that promotes the activity of microorganisms in the soil, as well as increases earthworm activity. Jeevamrutha also helps to prevent fungal and bacterial plant diseases. That Jeevamrutha is only needed for the first 3 years of the transition, after which the system becomes self sustaining.
2	Bijamrita	It is basically made up of water (20l), cow dung (5 kg), urine (5l), lime (50gm) and just a handful of soil.	Bijamrita is a seed treatment, equipped in protecting young roots from fungus as well as from soil-borne and seed-borne diseases.
3	Aechadana - Mulching	It could be done by soil mulch, straw mulch or live mulch	It conserves soil moisture, by reducing evaporation.
4	Whapasa - moisture	The irrigation should be reduced and irrigation should be practiced only at noon, in alternate furrows	Palekar challenges the idea that plant roots need a lot of water, in-fact, what roots need is water vapour, and therefore, Whapasa is the condition where there exist both air molecules and water molecules present in the soil.

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, 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, 2017).

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 toneighboring ZBNF farmer groups. 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 principal 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 living fences on the edges, and trenches for water harvesting.

Other important principles of ZBNF and points to note

1. Inter cropping - This is primarily how ZBNF gets its "Zero Budget" name. It doesn't mean that the farmer is going to have no costs at all, but rather that any costs will be compensated for by income from intercrops, making farming a close to zero budget activity.

2. Contours and bunds - To preserve rain water, Palekar explains in detail how to make the contours and bunds, which promote maximum efficacy for different crops.

3. Local species of earthworms- Palekar opposes the use of vermicompost. He claims that the revival of local deep soil earthworms through increased organic matter is most recommended.

4. Cowdung - According to Palekar, dung from the Bos indicus (humped cow) is most beneficial and has the highest concentrations of micro-organisms as compared to European cow breeds such as Holstein. The entire ZBNF method is centred on the Indian cow, which historically has been part of Indian rural life.

Further, depending on the nature and type of insect/pest attack, zero budget natural farming has come up with different formulations (neemastra, agniastra, and bramhastra among others) from locally available resources that work as bio-pesticides.

Advantages

Besides reduced input cost, farmers practicing ZBNF gets higher yields.

Elimination of chemical pesticides and promotion of good agronomic practices.

Promote regenerative agriculture, improve soil biodiversity and productivity.

Ensure decent livelihoods to smallholder farmers.

Restore ecosystem health through diverse, multi-layered cropping systems.

Anyone who is having half an acre of land can start ZBNF.

Using ZBNF techniques, one can convert even the most infertile land into a fertile one.

Women's empowerment and nutrition.

Conclusion

Natural Farming works not just in agronomic terms, but also brings about a variety of social and economic benefits. A majority of respondents reported that by adopting ZBNF, over time they saw improvements in yield, soil conservation, seed diversity, and quality of produce, household food autonomy, income, and health. Most experienced reduced farm expenses and a reduced need for credit, one of the major problems plaguing India farmers.

In conclusion, savings on the cost of seeds, fertilizers and plants protection chemicals has been substantial. The new system has freed the farmers from the debt trap and has instilled in them a renewed sense of confidence to make farming an economically viable venture.

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Atma Nirbhar Bharat Initiative Indefence

■ LT GEN VG KHANDARE (RETIRED)

Any aspiring nation must set its vision and all the citizens would have to be equally responsible stake holders and contributors to the achievement of the desired vision, mission and objectives. Such a commitment should cut across all fault lines within the nation. India is not alien to this fact, history is replete with illustrations of India's grandeur and the invasions to plunder its wealth. There were many looting campaigns victimising India, each worse than the other; degrading India's wealth of knowledge, goods, institutions and selfesteem. The most important reason for India beign enslaved for centuries was its neglect on security; incorrect assessments of the intent of the invaders and colonial powers and internal cohesion being weak. India in 2024 is looking ahead with the national vision outlined by the Hon'ble Prime Minister Shri Narendra Modi, focused to be a 'Viksit and Surakshit Desh' i.e. A Developed and Secure Nation by 2047, a timeline synchronised with 100 years of her Independence from the UK; this European Imperialist proved to be the dismantling power of Indian economy and security arrangement. From being 27% global GDP contributor in early 1700 CE when the British East India Company entrenched itself here, India crashed down to barely 3% global GDP contributor in 1940s when the exploiters finally left India. The Colonial power could not destroy Indian desire and spirit to be reborn, India's existence is of thousands of years of heritage and history establishing it as a rich cultural civilisation. The East India Company was formed in 1600 CE initiating the Ummaking of India by force, manipulation and enslavement in all domains of daily life in all segments of society. The end result was the exploitation and manipulation of the local systems and minds to leverage dependence of every common man, and indigenous institution on the British Crown. The attitude exchanged from civilisational pride to an era of self doubt and self criticism. Aping the West became the accepted norm. After over seven decade so far in dependence, a wave of resurgence to grow and be secure has been reborn. Hon'ble PM since 2014 initiated the Make in India mission symbolised by the Lion with gears, pulleys and machinery inside. The mission has initiated numerous changes to empower Self reliance in India that is Bharat. Coming to power with a falling Rupee between 2011 and 2013, the new Govt reformed the governance mechanism in pursuance to its vision of making India rise again. Fuelled by success from 2014 to 2019, by becoming a 2 trillion US \$ economy from an inherited 1 Trillion US \$ economy in 2014, the PM called for a growth trajectory quantifiably aimed at a US \$ 5 Trillion economy by 2024 as announced by him from the ramparts of Red Fort on 15 Aug 2019. The COVID Pandemic of 2020-21 initiated from China

coupled with the Chinese military LAC standoff, adversely impacted our national growth momentum. Despite these stumbling blocks India is marching on to achieve the 5 Trillion mark soon. Make in India that is Atma Nirbhar Mission is meant for all Ministries and encompasses the sum total of public and private sector has been a great reform in the defence sector. From the mentality of boasting as being one of the greatest importers of military hardware, India is moving to Make in India for itself and for the world. The current geopolitical world order is in a state of uncertainty and increasing disorder with Russia- Ukraine Kinetic Conflict, the radical HAMAS-Israel conflict, uncertain ty prevalent between China and Taiwan and multiple flash points due to the West promoting its agenda which is stonewalled and challenged by the resistant Russia, expansionist China, fiercely resilient Iran and the economically manipulated weak nations of the world. The situation is compounded by the evil issues of drugs proliferation, transnational terrorism, engineered asylum seekers, unfortunate refugees and ideology driven radicalisation. There are issues of climate change, poverty, health, cyber espionage-attacks, misinformation-disinformation, biochemical attacks etc which continue to disturb the world. In this era of turbulence and uncertainty India has confidently embarked on the Atma Nirbharta journey in multiple Ministries of which the Ministry of Defence is also an integral part. The reare multiple initiatives being acted upon to translate the vision into execution. Policy directives like DPP2016 and DAP2020 issued and in use. Structural changes-creation of the appointment of CDS and DMA as a vertical. Functional transformation-an intense study resulted in removal of Ordnance Factory Board and Corporatisation of Ordnance Factories to convert the 41 factories into seven DPSUs. Modernisation of the sentities is in progress. The DPSUs are challenged to modernise and improve the work culture for delivering quality products, at competitive pricing, timely delivery and with assured post sales service. DPSUs are already exporting their products and earning precious foreign exchange. Private sector is encouraged by users hand holding from inception stage to delivery stage. Defence Exports surged from Rs 686 crores in FY2013-14 to Rs 16,000 CR IN 2022-23 and is expected to cross Rs 20,000 Cr in a few months. This is in relentless pursuit of the Hon'ble PM star get assignment of 5 billion \$ worth of exports to be achieved. India is engaged with nearly 85 countries in defence exports. Major indigenous content in hardware and platforms. INS Vikrant (aircraft carrier), Light Combat Aircraft Tejas, Main Battle Tank Arjun, K9 Vajra tracked artillery gun, submarines, ships, boats, helicopters, drones, Electronic Warfare systems, missiles, rockets, Transport aircraft, radar set care being indigenously being manu-

factured.Joint Ventures model is preferred for international collaboration - BRAMHOS, AK 203 Rifle. Encouraged innovations through Start Ups and MSME with IDEX Challenges of which Indian Navy initiated the "Swavalamban" event with Hon'ble PM throwing open 75 maritime challenges to the Indian brains during DefExpo inJun 2022 followedby 75 Defence Space challenges in Oct 2022 again thrown open by Hon'ble PM. This is in addition to a series of DISC Challenges. Armed Forces promulgated five Positive Lists with 509 items and four positive lists were issued by DPSUs. These items are to be bought from indigenous manufacturers. 75% budgetary provisions are earmarked for capital acquisitions of indigenous products. Assured provision has been made for 25% Defence R&D budget. Def Expo and Aero India patronized Indian brand companies, MSMEs, Start Ups and academia. The Indian Embassies now host conferences, exhibitions and advertise Indian defence products, initiate technology and partner discovery in countries of choice. Dedicated Defence Corridors are set up in UP and Tamilnadu thus attracting an ecosystem in close proximity to build robust supply chain resilience. Process simplification for industry setting up and generating exports has been done. Enhancing opportunities for innovation through IDEX is in progress with initiative of Dept of Def Production. DRDO fusion with industry partners for technology discovery and to fruitfully utilise Technology Development Fund is the focus.Transferring technology (TOT) developed or acquired by DRDO to Indian Start Ups, MSMEs and established big defence manufacturers at a nominal cost is happening. MOUs of private sector with Dept of Def Production and DRDO, are being done thus encouraging user-innovator- manufacturer- financier interaction across the table. Setting up design, develop, market search entities in Services are established. DGQA reforms have been initiated and are being implemented. Promoting the concept of research and product designing with academia at multiple levels is paying off. States and UTs are facilitated to promote Defence technology research, encourage designing, developing prototype and manufacturing components - products. Critical technology attracting initiatives are in vogue through multiple engagement lines with friendly technology powers. To achieve timely results towards Atmanirbhar Bharat Mission over a sustained period the key issue is synergy between users, designers, developers, manufacturers, policymakers and financiers. Every citizen is a stakeholder in the growth of India to be a Viksit and Surakshit Desh by 2047.

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