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Minimum Support Price under the Aegis of Universal Basic Income: Understanding the Implications and Way Forward: A Review

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ABSTRACT

For several decades, the Indian government has established a minimum support price (MSP) program for agricultural commodities to alleviate farmers' price risks. Concerns have been expressed regarding the MSP approach, which can potentially disrupt market integration of agricultural commodities, change pricing incentives and alter the resource allocation and production among commodities. This review article addresses the current situation of agricultural commodity support pricing, how it can be more successful and whether it can be guaranteed. Following the Indian government's decision to repeal the three agricultural legislations, it has become increasingly clear that the MSP system needs a significant revision and that a change in discourse is must. MSP poses serious ramifications for soil health and water levels, particularly in rainfed regions that are quickly being converted to irrigated areas. A course correction is required, beginning with the demand and supply balance, while protecting farmers' interests through remunerative prices and assistance as and when needed. In addition to the use of data-driven technologies for the digitization of land records, issuing unique farm IDs and cropping system analysis, the necessity of pricing differential schemes in India has been explored.

Key words: Agricultural economics, Agriculture commodities, Land record digitization, Minimum Support Prices (MSP), Monoculture, Universal Basic Income.

Agriculture is a complex problem that poses critical concerns not just for India, but for all countries that are attempting to establish a balance between market and regulation. Farmers across the globe get government subsidies and each country has its system in place to ensure this. The Indian government supports its farmers by providing them with Minimum Support Prices (MSPs) for their crops. MSP is basically a support system in which the government buys certain commodities from farmers at fixed rates to secure them against price drops or market volatility. The official MSP rate is regularly revised and announced for listed crops each year as a significant component of India's agricultural pricing policy. However, currently, there are no legal backings for these rates, nor is there any legislation mandating their use (Balkrishna, 2021; Vanamali, 2021). MSP was first introduced with the onset of the green revolution that had materialized in the late 1960s, to encourage Punjab farmers to cultivate dwarf wheat varieties. The Indian Agricultural Research Institute (IARI) in New Delhi crossed this dwarf wheat variety with Indian cultivars after initially importing it from Mexico's International Centre for Maize and Wheat Research. It was referred to as "miracle wheat," and MSP was initially launched in order to further promote it and guarantee its exclusive production. Unfortunately, these dwarf wheat and engineered rice varieties were designed to respond well to fertilizer and required a good irrigation system, necessitating well irrigated or rainfed areas. At that time, the country had no fertilizer production plants and no other region except Western Uttar Pradesh, Haryana and Punjab, had similar land and water resources. This commanded the commencement of fertilizers import, a predicament still continuing, which severely strains the economy (Balkrishna *et al*., 2020; Nair, 2019). However, following the green revolution, India became self-sufficient in grain production, which is the prime reason for MSP sustenance and promotion of rice and wheat crops.

While there are articles on agriculture, there are few scientific publications that address the MSP and provide consolidated information and very fewer seemed to offer a complete scientific perspective in an objective way, which is what we have attempted to do by putting forth this paper (Aditya *et al*., 2017; Chintapalli and Tang, 2022; Das, 2020). A detailed insight covering all the relevant data pertaining to MSP, starting from the agricultural commodities it covers, the role of Commission for Agricultural Costs and Prices

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(CACP), the fiscal burden it currently poses, legal implications of MSP, the case of Green revolution belt and non-belt regions, functioning of APMC mandis, monocropping and its implications on water table, the disputed farm laws and the respective bills, a reflection of irregularities in the MSP procurement policy across the major states in India, the grain losses and inadequate warehousing system and the government support systems including PDS, PDPS (for ex. *Bhawantar Bhugtan Yojna*), PM-AASHA, PM-KISAN, *etc.* have been covered. Authors have argued for a policy shift and a swift transition to Income-based support systems to the farmers rather than a price-based MSP system. The government is gradually adopting from the policies of developed agricultural nations, for example, the targeted basic income schemes PM-KISAN, as well as PM-AASHA which is a remunerative plan based on credit-linked MSP. Still, a lag is being observed which is primarily due to an inadequate digital infrastructure. The most important prerequisite for implementing such a transformation is proper identification of the land and the landowner, precise mapping of the areas with an appropriate level of automation and a universally accessible integrated strategy. This article aims is to present a profound viewpoint of the MSP, while putting forward the expert perspectives as well as pertinent research studies and present a suggestive and corrective future action.

Methodology

Strategy

As a modern perspective of agricultural support systems comes into effect in India, this review paper was prepared focusing on the provision of MSP in Indian agriculture, its support structure, legal perspectives, fiscal implications, in relation to inadequacy of the procurement structure, warehouses and digital management systems and what steps have recently been taken to improve upon it. The concept and procedure of a remunerative credit-linked MSP system to solve the shortcomings in the previous MSP system have been considered as a way forward. The work was done at Herbal Research Department of Patanjali Research Institute, Haridwar.

Data sources and extraction

Google Scholar, Semantic Scholar and Zenodo databases were used to gather research completed till September 2022. Available literature was retrieved using the search keywords “MSP” in combination with “Agriculture”, “APMC”, “Monocropping”, “Farm legislation”, “Procurement” and “Remunerative schemes”. The literature search in this article was not limited to scientific papers listed in the aforementioned databases but also included other sources like government databases and databases like CEIC data and news articles, that may be openly available to the scientific community as references. Published works, ideally in English, were chosen as search targets across multiple sources and databases.

Reviews and discussions

Indian farming system in conjunction with MSP

In India, the green revolution was essentially chemical fertilizer-centric farming centered on the twin pillars of wheat and rice. This led to excessive use of pesticides and fertilizers which damages the environment and human health, resulting in widespread soil degradation, mainly in Punjab, followed by Haryana and Uttar Pradesh (Balkrishna, *et al*., 2021; Mehta *et al*., 2021). Heavily subsidized electricity, further causes widespread water extractions, resulting in dropping water tables and depleted water reservoirs. Unrestricted use of urea in wheat and rice fields results in high levels of nitrate ions in the water table, leaving it unsuitable for human consumption (Water Science School, 2018). Monocropping, although crucial for food security of a nation, has several major downsides, as it is chemical fertilizer-centric, that intensifies water consumption, furthers biodiversity loss and impacts pollinator species, culminating to soil degradation and fertility loss (Balkrishna, 2021; EOS, 2020; Mehta *et al*., 2021). The land degradation is one of the most serious environmental issues, impacting more than 30% of the country’s total geographical area of 328.73 million hectares (MHA). According to the Desertification and Land Degradation Atlas of India, 97.85 MHA area stands degraded till 2018-19 and a progressive degradation has been observed between 2011-13 and 2018-19 with 28.76% during 2003-05, climbing to 29.32% in 2011-13 to 29.7% in the latest atlas issued in 2021 (Space Application Centre, 2016, 2021). The land desertification has impacted 28 of India’s 31 states and union territories, with one of the primary reasons being the loss of soil cover caused by rainfall and surface runoff (Pandey, 2021). This is significant because India’s agricultural policy has always favored a resource, chemical as well as energy-intensive cropping patterns and practices, which perform well on irrigated fields but are unsustainable or the 66% of the country’s farmland that is rainfed (Dwivedi *et al*., 2021). As a result, rainfed areas are ghastly being converted to irrigated land, hence, a unique strategy is urgently needed for rainfed lands (Sengupta, 2021).

Monocropping and its consequences are frequently neglected due to the high profits gained from wheat and rice farming alone. According to the Cost of Cultivation Statistics of 2019, a regular farmer from Punjab would have made INR 84,765 from rice per hectare (unmilled) and INR 71,103 from wheat per hectare. Collectively, the farmer earns around INR 1.55 lakh per hectare per year with a rice-wheat crop combination, equating to around INR 5.6 lakhs per year, based on Punjab’s average operational landholding size of 3.6 hectares. In contrast, Bihar’s farmer earns just around Rs 1.0 lakh per hectare from a rice-wheat crop combination, with rice and wheat yielding Rs 51,270 and Rs 48,517 per hectare, respectively (CEIC, 2019b, 2019a, 2019c). Since the average land holding size in Bihar is just 0.39 hectares, this figure further dribbles down to INR 39,000 in revenues.

Farming is therefore not considered a profitable business in Bihar, as nearly 90% of farmers in this state fall into the marginal category (<1.0 ha of land holding) and the state government further imposes a paddy procurement cap of 100 quintals on such farmers (*Agriculture Census 2015-16*, 2019; Tewary, 2020). Despite being among the major rice and wheat-producing states, Bihar's MSP procurement share between 2012-2022 is just one-eighth that of Punjab, ranking among the lowest in the country (Fig 1). This exacerbates the plight of small and marginal farmer communities across the country, with 86.21% of Indian farmers falling into this group. Furthermore, there have been claims of illegal siphoning of paddy and wheat output to Punjab, with intermediaries stealing most of the revenues. The fundamental reason for this is that almost all of Punjab's paddy is lifted at MSP, whereas states like Bihar, Madhya Pradesh and others are left behind despite growing considerable amounts of paddy (Ray, 2021). Unlike some other states and harvests, rice and wheat farming in Punjab pays well and continues to do so. For this consistency and regularity of the revenues, a primary reluctance towards diversification among the traditional green revolution states is usually observed. For other crops, a very erratic and fluctuating market rates exits which discourage their growers. Apart from this, farmers also evaluate labor availability and wages, as well as the degree of mechanization in a crop (Saini and Hussain, 2022).

There is no formula-based procurement system in India and the existing system appears to be significantly influenced by political reasons. As a result, the state's water and soil resources have been steadily diminishing (DTE, 1999; Kumar, 2022). According to the State of the World Report 1998, the state's water table might be drained as early as 2025. Before the early years of the green revolution, the water table was higher and depletion rates were lower. In response to the state's water problem and to handle the state's agrarian difficulties, Punjab State Farmers and Farm Workers Commission (PSFFWC) was established in 2005. The commission assisted significantly in drafting and bringing forward the Punjab Preservation of Subsoil Water Act, 2009, which attempts to conserve groundwater. This act provisioned for transplantations of paddy only after the most severe phase of evapotranspiration, which occurs in the state around mid-year (10th of June). This strategy was a great success and the neighboring state of Haryana adapted the law as well (Sood, 2014). As reported in many studies and presented in the graph below (Fig 2), the Subsoil Water Act has indeed helped in containing the growing rates of water depletion after its enactment (Vatta, 2014). Recently, the Central Ground Water Board (CGWB) has released a Master Plan for Artificial Recharge to Groundwater 2020, developed in collaboration with states/UTs. CGWB is currently conducting a countrywide aquifer mapping and management program as part of its groundwater management and regulation scheme (Kumar, 2022).

There have been several discussions in the past concluding that currently there is no equivalence for rice and wheat, although, both of these require large amounts of N-based fertilizers. Hence, adopting efficient irrigation technologies supplemented with a precise and economic fertilizer application strategy is the answer to this crisis. And parallelly, the unrestrained use of urea must be curtailed in the states of Punjab, Haryana and western Uttar Pradesh. This could practically be strategized by disincentivizing the farmer from continuously following the wheat-rice rotation and promoting the cultivation of nutrition-rich millets like bajra, maize and ragi, which are significantly less dependent

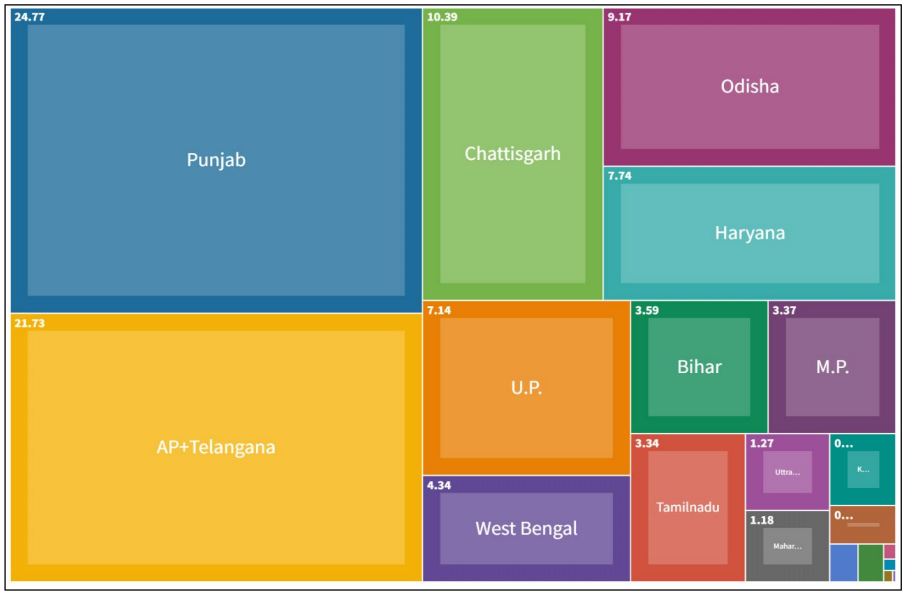

Fig 1: A tree map reflecting the individual share (%) of respective states in MSP procurement of paddy between 2011-12 to 2021-22 (FCI, 2022)..

on the urea-based fertilizers. This can be done by substantially raising the MSP of these crops compared to either wheat or rice (Nair, 2021).

Farm laws 2020 and its stipulated impact on MSP

The Central administration got a fast-track approval for three contentious agriculture bills or farm laws earlier in the year 2020. Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Act, 2020, Farmers' Produce Trade and Commerce (Promotion and Facilitation) Act, 2020 and Essential Commodities (Amendment) Act, 2020 were the laws in dispute. All three laws have been abolished as of November 29th, 2021 (DTE, 2021). The Farmers Produce Trade and Commerce (Promotion and Facilitation) Bill sought to remove the FCI and APMC's current trade and distribution monopolies. This Act permitted farmers to sell outside of their assigned APMC regions, promoting their direct engagement with the market. The Farmers (Empowerment and Protection) Agreement of Price Assurance and Farm Services Bill was the second and it aimed to make it easier for farmers to engage in contract farming through verbal or written agreements. This was meant to provide farmers with access to nationwide and commercial markets. The third law was an amendment to the Essential Commodities Act 1955, which deregulated grains, pulses, oilseeds, edible oils, onions and potatoes.

Agriculture, a crucial area of the Indian economy, has been waiting for change for a long time and these three policies attempted to bring it about through liberalization and deregulation of the sector. Instead, a subset of farmer unions, primarily in Punjab and Haryana, believed that quick passage of the legislation was intended to phase out public procurement through MSP, allowing private corporate players to mend their ways further. Since, the corporates have long been viewed as villains by farmer communities across the country, the government eventually acknowledged the farmers concerns and dropped the acts. However, the concerns of farmers regarding the MSPs being phased out under the new regulations seems to be mostly unfounded. Although, the MSP and procurement are administrative decisions and the government may easily terminate without the assistance of any legislation or law, the data of recent activities on MSP and procurement suggests otherwise. In reality, the MSP system has in fact been pushed farther in the last six years and the key crops tariffs have continued to rise (Table 1).

Recently, the MSP was hiked for the Kharif Marketing Season (KMS) 2022-23 and interestingly, the government

Table 1: Minimum support prices of all crops for the marketing seasons of 2013-14 to 2014-15 and 2020-21 up to 2022-23.

Crops	MSP (INR per quintal)					Cost of production	Return over
	2013-14	2014-15	2020-21	2021-22	2022-23	2022-23	cost (in %)
***Kharif* crops**							
Paddy (Common)	1310	1360	1868	1940	2040	1360	50
Paddy (Grade A)	1345	1400	1888	1960	2060	-	-
Jowar (Hybrid)	1500	1530	2620	2738	2970	1977	50
Jowar (Maldandi)	1520	1550	2640	2758	2990	-	-
Bajra	1250	1250	2150	2250	2350	1268	85
Ragi	1310	1500	3295	3377	3578	2385	50
Maize	1500	1310	1850	1870	1962	1308	50
Tur (Arhar)	4300	4350	6000	6300	6600	4131	60
Moong	4500	4600	7196	7275	7755	5167	50
Urad	4300	4350	6000	6300	6600	4155	59
Groundnut	3700	4000	5275	5550	5850	3873	51
Sunflower Seed	3700	3750	5885	6015	6400	4113	56
Soyabean (yellow)	2560	2560	3880	3950	4300	2805	53
Sesamum	4500	4600	6855	7307	7830	5220	50
Nigerseed	3500	3600	6695	6930	7287	4858	50
Cotton (Medium Staple)	4000	3750	5515	5726	6080	4053	50
Cotton (Long Staple)	4000	4050	5825	6025	6380	-	-
***Rabi* Crops**							
Wheat	1400	1450	1925	1975	2015	1008	100
Barley	1100	1150	1525	1600	1635	1019	60
Gram	3100	3175	4875	5100	5230	3004	74
Masur (lentil)	2950	3075	4800	5100	5500	3079	79
Rapeseed and mustard	3050	3100	4425	4650	5050	2523	100
Safflower	3000	3050	5215	5327	5441	3627	50

Data source: (CCEA by PIB, Delhi); '-' data not available.

is attempting to encourage agricultural diversification by recalibrating MSP in favor of pulses, oilseeds and coarse grains like Bajra, Ragi and so on and the return on cost has been set at more than 50% for these commodities, while it has been fixed at 50% for other crops (PIB, 2021, 2022). The radar map presented below makes it further evident that MSP rates have shifted in favor of crops other than wheat and rice in recent years (Fig 3). The MSP rates are higher for Arhar, Urad, Sunflower, Groundnut, Ragi and nigerseeds, which is because return over MSP is set at more than 50% for these crops. This will encourage farmers to cultivate more of these crops and help alleviate the

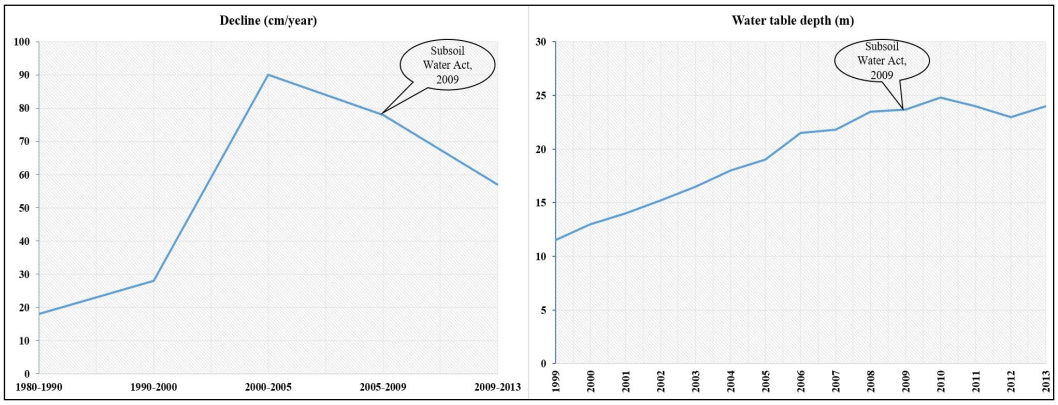

Fig 2: Rate of the declining water table and its depth in the State of Punjab, India.

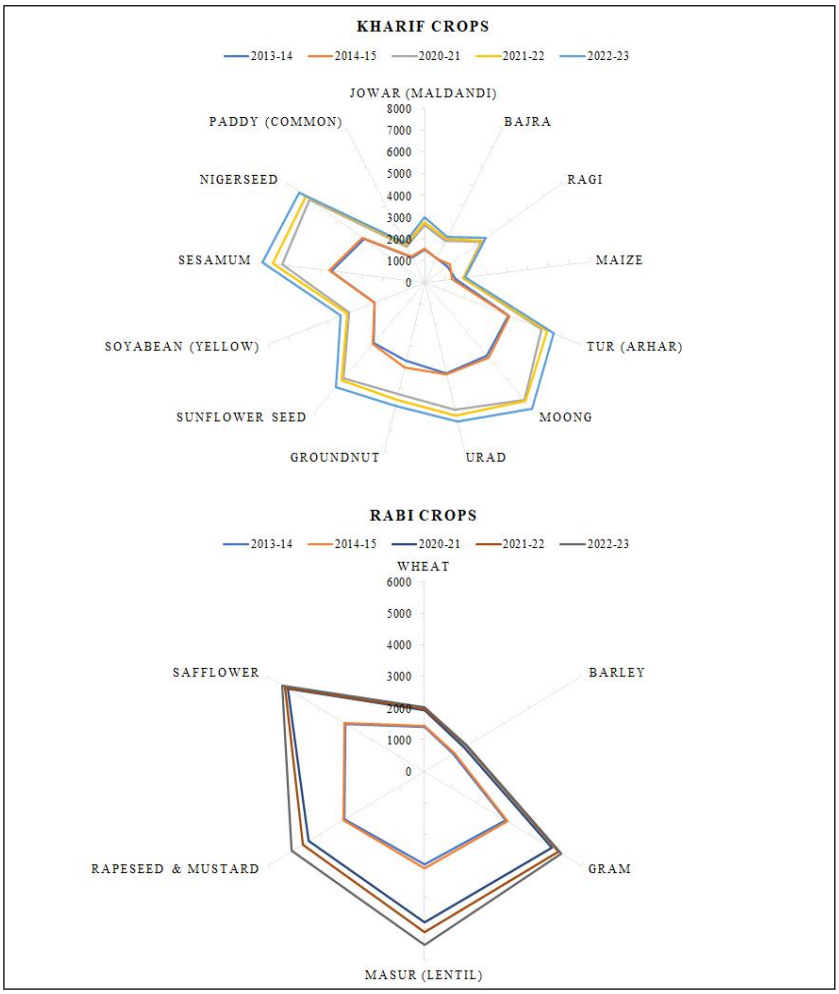

Fig 3: MSP radar map for the *rabi* and *kharif* crops of India.

demand-supply disparity. The production of nutrient-rich cereals in place of rice-wheat crops will help in slowing the pace at which rain-fed areas being converted to irrigated areas. Furthermore, the PM-AASHA umbrella programmes give remunerative returns to farmers through three pilot sub-schemes: Price Support Scheme, Price Deficiency Payment Scheme and Private Procurement and Stockist Scheme (PIB, 2018).

The MSP is one of the four pillars of food security, notably in the case of rice and wheat, with procurement, buffer stock and PDS rounding out the other three. Its abolition would thus put the entire system in danger and no sensible government would want to risk weakening a system that has effectively accomplished the goals of food security, price stability and food self-sufficiency (Arya *et al*., 2021; Balkrishna *et al*., 2021). However, the core issue is that the MSP is driven by inherent bias in its operations, such as disproportionate land holdings and state prejudice in MSP procurements which makes it unsustainable in its current form and hence cannot continue indefinitely. A disproportionate MSP operation exacerbates the problem and fosters land and resource misuse. But the MSP cannot be discontinued at this point, rather it can be targeted with more sophisticated and appropriate approaches.

Legalizing MSP: Implications and the fiscal burden

MSP guarantees farmers a profit of at least 50% above the cost of production and, if farmers can fetch a higher price than MSP, they are allowed to sell to non-government parties. However, MSP is often found to offer little help, as the prices obtained by farmers in most commodities, particularly during harvest season, are far lower than the legally reported MSPs. The issue is that the MSP had no legal legitimacy and the farmers cannot claim MSPs as a matter of right since it lacks a statutory basis. But, if the government decides to grant MSP a legal status, it has indeed a few options. First, it can oblige private merchants or processors to acquire the crop, as is now done in the case of sugarcane under the Sugarcane (Control) Order, 1966, where millers are obligated to pay producers a fair and remunerative price (FRP) within 14 days of purchase. Alternatively, the government can get goods at MSPs through its organizations such as the Food Corporation of India (FCI), the National Agricultural Cooperative Marketing Federation of India (Nafed) and the Cotton Corporation of India (CCI). In general, successful MSP implementation occurs only for

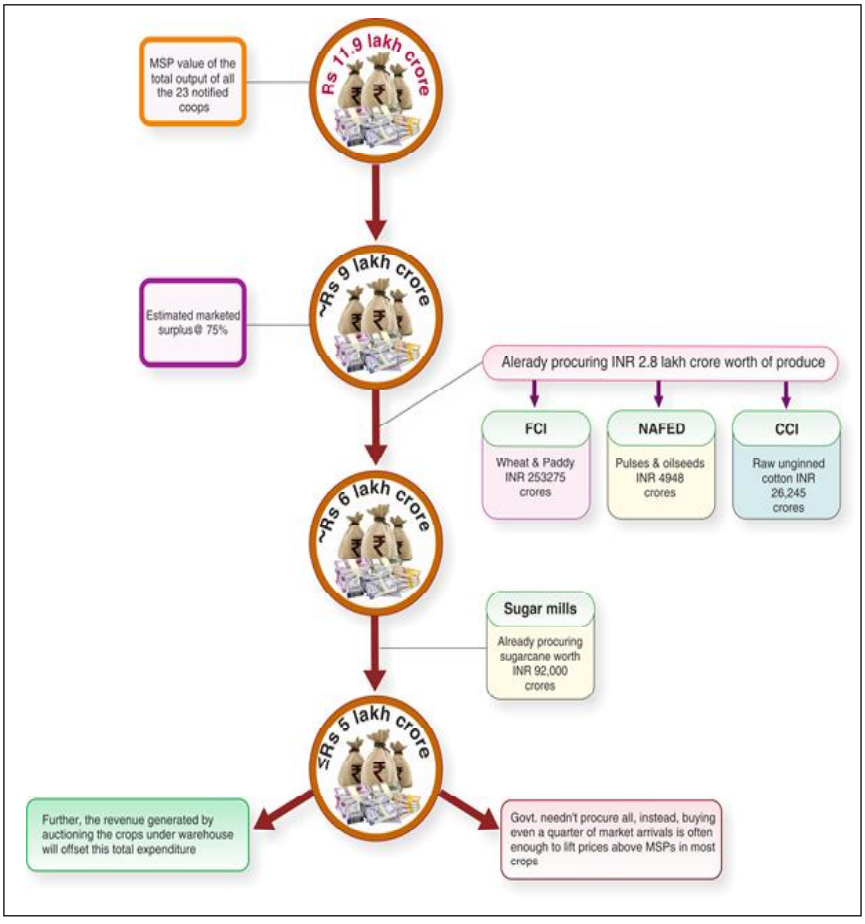

Fig 4: The fiscal cost of legalizing the MSP based on the estimates for 2020-21.

four key crops: rice, wheat, cotton and sugarcane, whereas it is either incomplete or inadequate for other listed crops. But, if the MSP is properly enforced for all 25 commodities, the government will have to shoulder an additional fiscal cost of roughly or less than INR 5 lakh crores for their whole marketable excess (Fig 4). This isn't even the true difficulty when we look up to the inefficient public procurement and stocking processes, which provides a lot of room for corruption and leakage from warehouses, ration shops and transportation and it gets much more complicated when it comes to clearing oil seeds like safflower and nigerseed through the public distribution system (PDS) (Damodaran, 2021a).

Furthermore, legalizing the MSP would lead to inflation, since the businesses would need to mandatorily acquire commodities above the MSP regardless of the demand or global price, which would apparently distort the markets. Moreover, since the government-controlled prices are significantly higher than domestic and international market prices, it would never be sustainable for merchants and will make agricultural exports uncompetitive. Other repercussions include increased water and land resource imbalances, as well as dedicated usage of more agricultural lands for crops like wheat, rice and water-guzzling sugarcane, which would mean increased demand for expensive imports of pulses and oilseeds (Fig 5). Furthermore, if the government intends to export excess grains at subsidized rates beyond a specific threshold, it may face WTO opposition which regulates the international markets. When India experienced severe food shortages in the past, the MSP policy had helped as a promise for government's interventions if prices fell beyond a certain threshold, which prevented distress sales. Today India is a self-sufficient nation and its agriculture strategies for dealing with current surpluses must be substantially different from those used in the past to deal with shortages (HT Correspondent, 2020). Considering these constraints, legalizing MSP does not seem to be a good idea as it can potentially ruin Indian agriculture. Providing a legal guarantee to MSP will result in inappropriate planting patterns that favor high-yielding crops (Vanamali, 2021).

However, there is another option to ensure MSP through price deficiency payments, which is essentially a middle ground in which the government neither compels private participants nor directly purchases an entire lot of produce. Instead, after permitting farmers to sell at market prices, the government simply pays out the difference between the MSP and the commodity's average market price for the harvesting season. Indian government has introduced a new plan known as PM-AASHA under the price deficiency payment system (PDPS), which is intended for certain crops, like oilseeds (sunflower, safflower, groundnut, nigerseeds, *etc*). For such crops, economists are increasingly in agreement that farmers should be guaranteed minimum incomes rather than prices, because they complicate the PDS operations due to their need for specific storage areas and effective inventory management, which essentially implies higher carryover costs; also, they must be processed before consumption. PDPS comprises of providing more

Fig 5: Limitations and implications associated with MSP.

direct payment transfers on a flat per-acre or per-farm household basis, with a farmer registering with the local APMC mandi and reporting the entire area seeded to qualify.

The policy shifts

Price-based to Income-based

To safeguard farmers' incomes, most nations are changing from pricing regulations to income policies, such as Universal Basic Income (UBI) plans, which provide a monthly, unconditional cash transfer to every household in the country. Since its inception in the West, most likely in the 16th century, the concept has undergone several revisions, with several emerging economies employing a modified form of UBI to assure farmer income and shield them from the impending threat of unpredictable and dropping prices. The advantage appears to be that UBI does not intervene in the agricultural market and allows free trade, does not impair loan credit in the form of weavers, does not encourage monocropping and avoids complex and costly administrative procedures as well as sluggishness in implementing schemes such as grain procurement under the PDS System. A modified version of this system, known as PM-KISAN, a targeted basic income plan, has recently been adopted in the nation, under which a defined quantity of money is directly paid to farmers throughout each cropping season (Balkrishna *et al*., 2022; Balkrishna *et al*., 2021). PM-KISAN is currently in its first stage of transitioning from price-based to income-based policy. The list of beneficiary farmers was compiled utilizing land records and the underlying technology of modern technologies such as cadastral mapping, geo-referencing and geo-tagging on ROR (Record of Rights) databases. Although PM-KISAN benefits approximately 120 million farmers with less than 5 acres of land across India, individual states are also adopting similar basic income programs such as Telangana's Rythu Bandhu and Andhra's Rythu Bharosa, Odisha's Kalia schemes and so on (Reddy, 2020).

Procurement-based to Credit-based MSP

The government sets the prices of commodities under the current MSP policy, which is a procurement-based intervention. Farmers react to these prices by deciding how much of their commodities to sow. The government gives complete control over the purchase and disposal of products, but this only produces short-term benefits and disrupts the market economy. Small and marginal farmers, who make up the bulk of growers, are the ones that gain the least. The Credit-based MSP, however, is a price deficit financing program in which, should the market price of the commodity fall below the predetermined MSP, the government would not take possession of the produce but would instead grant a financial credit to the farmers farming it. Credit-based strategy has its origins in the 'Brannan plan,' which was developed in the United States in the early 1950s. India has recently implemented a form of it called as the Bhawantar Bhugtan Yojana (BBY), which is essentially a PDPS system. The state of Madhya Pradesh has introduced BBY, which guarantees farmers fair prices for 13 important crops, the majority of which are pulses and oilseeds. There will be no actual acquisition of crops; instead, authorities would pay farmers in the case of a price drop. A modal price, which is an arithmetic average of recent market prices of the crop within the state, determines the actual amount of compensation (or shortfall payment) paid to a farmer. PM-AASHA is modeled after the BBY and a similar plan implemented by the Haryana government called Bhavantar Bharpai Yojana (Mukherjee, 2018).

Challenges to the current agricultural support schemes and future prospects

There are intrinsic obstacles to the agricultural support schemes like MSP, PM-KISAN, *etc*. that are either rarely explored or completely ignored. There are issues such as larger landowners receiving more money than small farmers. For example, under the Rythu Bandu scheme, farmers receive the aid of INR 5000 per acre of agricultural land without regard to land size, resulting in a disproportionate release of funds to large land-holding farmers who receive more support than the actual target groups of small or marginal farmers (Balkrishna *et al*., 2020; Vadlapatla, 2021). Furthermore, there is always the possibility of tweaking the beneficiary count in the physical datasets under political affiliations. This bias leads to inclusion errors, in which a benefactor may be an absentee landowner or a wealthy farmer with greater land holdings rather than genuine farmers or tenant farmers who incur all the risks. Exclusion error is also defined as when a fraction of persons who are supposed to benefit are excluded from the plan due to poor design.

These systems are currently based on a people-centric identification strategy, in which individuals are validated using recognized identity cards (Aadhar, Voter, PAN, *etc*.) coupled with their land records. This strategy has drawbacks in the eventuality of the farmer selling his property, changes to the ownership, death of the farmer and so on. In these cases, changes are not often reflected in real-time and money is transferred based on outdated information. Instead, the method should be land record centric, which means that a unique identifier should be based on land ownership. Furthermore, to administer any sort of PM-KISAN-type income assistance to farmers, India's government must accurately identify farmers with no room for error. For example, land record digitization is still a work in progress, with approximately 93% computerization of land records, 70% digitalization of cadastral, 60% integration of text-based and spatial data and Record of Rights (ROR) of 31 out of 37 states made web-accessible and establishment of data centers in 22 states completed to date; the digitalization efforts must be accelerated (*DILRMP - Dashboard*, 2022). Moreover, Millions of Indians have been fighting court disputes for years because of poor land records. According to statistics from the Department of Land Resources, 58,10,300 plots in 18 states and Union territories have been surveyed and granted a Unique Land Parcel Identification

Number (ULPIN). The ULPIN, like Aadhar, is a unique 14-digit alphanumeric ID produced for a land parcel or plot. The Indian government has even announced a software designed to be a one-stop-shop for land registration and record storage. This software system, known as the 'National Generic Document Registration System' (NGDRS) once implemented will ease the registration process with its unique Anywhere Registration platform. This intends for a digital registration process requiring less than 20 minutes to make land registries, with very little manual effort. This plans to facilitate the agricultural department in matching farmers to their land holding records and the IT department is supposed to get any property-related transactions nearly instantaneously (Sharma, 2022). Though the scheme's goal is to create transparent and tamper-proof land records, decreasing property disputes and fraudulent transactions, government is currently ill-equipped to track the data on the reduction in land frauds due to land digitization. The impact of land digitization will be difficult to quantify in the absence of such a record. State land portals have major shortcomings as well, such as incorrect data input, a mismatch in the area of land and so on (Mahesh, 2021; Menasinakai, 2021). A failproof system of measuring land and keeping digital records would go a long way toward unlocking value in rural India, reducing conflicts and unclogging courts.

However, dealing with land records is a two-edged sword: precise and accurate land records may bring about transformation, but erroneous records may attract confrontations, consequently escalating conflict. The Indian Institute of Human Settlement's policy paper on Land Modernization discusses how land digitization accuracy is based on the reconciliation of three data types: textual records, spatial records and satellite map data and a discrepancy in any of these data sets can encourage additional legal conflict (IIHS, n.d.). Concerns about technology in land governance are less about its efficiency and more about the architecture that underpins it. Primary problems include the selection of technology, use of the data and its access, privacy concerns and the methods used to acquire and analyze such data. Currently, different states have embraced different technologies and there is no suggestion in the department to implement blockchain technology (Panchapagesan, 2018). Experts agree that merely adopting the technology is not a solution, as it might be insufficient to handle the complex difficulties of land management (Muthyanolla, 2022). The digitization of a sluggish data might have severe effects, especially on the poor and vulnerable and the schemes will continue to be error-prone unless they are managed by a standardized verification method, such as digital land records, validated bank accounts, tenancy certifications, *etc.*, supported by an appropriate technological landscape of geo-fencing, geo-referencing and geo-tagging, which would protect land records from infringements and discourage malpractices. With the approval for the use of drone technology in remote sensing and data collection of agricultural areas in 100 districts across the country, panchayat level yield estimation under the PMFBY crop insurance scheme and integration of these digital land records with the nodal procurement agencies, the government intends a straightforward engagement to farmers for purchasing their produce (Shukla, 2021).

CONCLUSION

In these periods of transition, securing farmers' incomes through pricing policy is impractical. It will only lead to inefficiency, causing India to lose its competitive advantage in a global economy that is rapidly developing. This however does not mean that the government should not support and secure farmers' livelihoods. As agriculture employs a sizable portion of the workforce, the government is obliged to do so. The ongoing massive effort to map and digitize India's 800 million land parcels would increase transparency, reduce the number of court proceedings and assist develop large bankable assets throughout rural India. If the mapping and digitization of agricultural areas in nations like India is done correctly, significant quantities of money would flow into the pockets of rural people and poor farmers. This will also help solve the concurrent issue of loans on a mortgage of properties. However, simply digitizing land records will not help much; instead, developing a solid data pool using modern data collection and analytic approaches, such as using high-resolution cadastral maps, identification of crops and diseases using satellite and drone imagery, generation of soil health reports, as well as suggestions for accurate nutritional regimes based on digital soil test reports, access to government schemes, credit loans and digital certifications. All these critical elements play a significant role in maintaining food security and agricultural sustainability not just for India, but also for all those economies upon which the world food security is reliant. Certainly, in these difficult times when nations are at a crossroads with issues such as market volatility, food security concerns related to political conflicts and a reconsideration of securing the global corridors, there is an even greater need to support food producers and look at their issues, as well as provide a platform where they can be empowered with modern technologies. Powerful nations must be more open to sharing their established ecosystems with emerging nations since these nations play a larger role in the production of staple crops such as rice, wheat, lentils and so on.

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