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Cropping Pattern, Food Security and Viksit Bharat: Present Status and Way Forward

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Abstract:

Viksit Bharat or Developed India represents a comprehensive national vision aimed at transforming India into a fully developed nation by 2047, marking the centenary of independence. This initiative encompasses multidimensional development across economic, infrastructural, educational, healthcare, sustainability, and technological domains. A cornerstone of this vision is ensuring consistent access to sufficient, safe, nutritious, and diverse food resources for all citizens. However, current agricultural trends in Maharashtra present concerning patterns that may impede progress toward these objectives.

Analysis of Maharashtra's agricultural data reveals a significant shift in cropping patterns toward commercial cultivation. While production of staple grains such as wheat and rice has increased with wheat production rising by approximately 23% and rice by 17% over the past decade, there has been a marked decline in the cultivation of nutritionally dense coarse cereals and millets showing approximately 31% reduction in cultivation area since 2010. This shift toward mono-cropping commercial agriculture presents potential challenges for comprehensive food security goals and Viksit Bharat.

The National Food Security Act enacted by the Indian Parliament in 2013, established a legal framework to ensure food security through subsidized grain distribution to eligible households. The Act primarily addresses three fundamental dimensions of food security: availability, accessibility, and affordability. According to government data, the program currently reaches approximately 813 million beneficiaries nearly 67% of the population. However, this legislation addresses only partial aspects of the more comprehensive definition of food security established by international organizations such as the World Health Organization and the Food and Agriculture Organization, which encompasses nutritional adequacy, dietary diversity, and sustainability factors.

The emerging negative correlation between Maharashtra's evolving cropping patterns and comprehensive food security principles is particularly concerning within the context of Viksit Bharat aspirations. This study examines the relationship between Maharashtra's cropping patterns and food security outcomes, while also investigating the nutritional significance of millets and their production trends both within Maharashtra and globally. Global millet production has increased by approximately 4.7% annually since 2018, contrasting with Maharashtra's declining production trends, highlighting potential opportunities for agricultural policy recalibration to better align with comprehensive food security objectives.

Introduction:

Cropping pattern refers to the combination of crops grown on a particular piece of land over a defined period, typically a year or a season. It represents the sequence, frequency, and timing of different crops grown on a particular field or farm. It is influenced by various physical, economic, social, infrastructural and technological and governmental factors such as fertility of

soil, weather and climate, availability of water and irrigational facilities, market and demand, prices, availability of technology, seeds, pesticides and fertilizers, government policies, labour supply and cost etc.

Objectives:

1. To evaluate the changing pattern of area under cultivation and the output quantities of various crops in Maharashtra across different time periods.
2. To perform an in-depth analysis of millet cultivation outputs in Maharashtra and across major global production regions.
3. To analyze the nutrient components and health advantages of commonly grown millet varieties by examining their nutritional profiles and benefits compared to traditional cereal grains.

Methodology:

This research employs descriptive methodology founded on thorough secondary data analysis, encompassing 400 surveyed households across all talukas of Nanded district. The in-depth survey was conducted to understand food preferences and cropping patterns throughout the district. The study draws from multiple authoritative data sources, including government agricultural reports, statistical yearbooks, and district-level production records from Maharashtra's Agricultural Department. The research is further enhanced with data from FAO statistical databases, WHO nutritional reports, and ICMR dietary guidelines. Supplementary information comes from peer-reviewed journal articles and published academic books. The analytical framework incorporates various statistical tools, notably compound annual growth rate calculations, correlation analysis, and trend analysis. Time-series methodologies are applied to examine production patterns and track changes in cultivated areas over different periods.

Cropping pattern of Maharashtra:

Table1: Area Under Cultivation: Food vs Non-Food grain
(Th hectares and Th. tonnes)

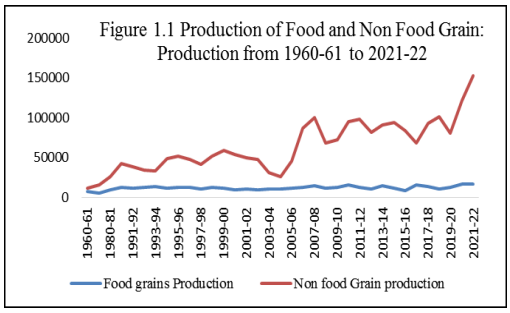
SN	Year	Area		Production	
		Food grains	Non-food grain	Food grains	Non-food grain
1	1960-61	12955.00	4523.00	7744.00	12077.00
2	1970-71	12886.00	4635.00	5414.00	15670.00
3	1980-81	13691.00	4588.00	9472.00	25658.00
4	1990-91	15873.70	6040.40	12796.40	42244.10
5	2000-01	13421.10	6257.10	10133.60	53527.10
6	2005-06	12737.00	7048.00	11808.00	45422.00
7	2010-11	13026.00	8540.00	15420.00	95463.70
8	2015-16	11212.00	9398.00	8439.70	83615.70
9	2016-17	12848.70	8841.70	15602.70	67994.70
10	2017-18	12158.00	9387.10	14103.40	93284.40
11	2018-19	10429.40	9838.30	10628.40	101246.20
12	2019-20	11168.40	9839.60	12954.30	81127.90
13	2020-21	11607.70	10412.28	16523.00	121961.00
14	2021-22	11873.00	10932.00	16949.00	152904.00

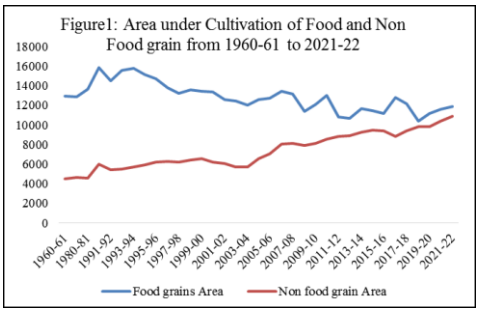
Source: Compiled from economics survey of Maharashtra 1995-96 to 2022-23

The table 1 presents data on the area under cultivation of food and non-food grains in Maharashtra from 1960-61 to 2021-22. It shows some interesting trends in the changes in cultivation patterns over the past six decades.

The area under food grains cultivation has been relatively stable from 12,955 thousand hectares in 1960-61 to 11,873 thousand hectares in 2021-22, representing a modest change of about 8.4% over the 60-year period. In contrast, the area under non-food grains has grown more rapidly from 4,523 thousand hectares to 10,932 thousand hectares, representing a growth of 142% during the same period.

The trend is shown in the figure 1. In the 1960s, food grains accounted for nearly 74% of the total cultivated area, while non-food grains were only 26%. However, by the 2010s, this gap had narrowed significantly. In 2021-22, food grains accounted for only 52% of the total cultivated area, while non-food grains made up 48%. This represents a major shift in cropping patterns from an overwhelming focus on staple cereals to more commercial and horticultural crops.





Cereals and Coarse Cereals: Area under cultivation and Production:

The data presents a comprehensive view of cereal cultivation patterns in Maharashtra over six decades, revealing significant shifts in agricultural priorities. From 1960-61 to 2021-22, there has been a notable transformation in the allocation of land between total cereals (primarily rice and wheat) and coarse cereals.

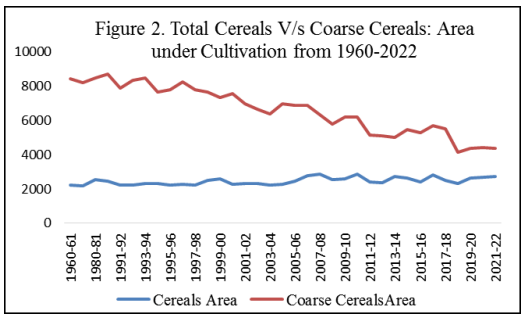
In 1960-61, coarse cereals dominated the agricultural landscape with 8,399 thousand hectares under cultivation, nearly four times larger than the area devoted to total cereals (2,207 thousand hectares). This reflected traditional farming practices and dietary preferences prevalent in Maharashtra during that period. However, by 2021-22, the cultivation area for coarse cereals declined dramatically to 4,345 thousand hectares, representing a reduction of approximately 48% from the 1960s levels. Concurrently, the area under total cereals cultivation increased moderately to 2,707 thousand hectares, showing a growth of about 23% over the same period.

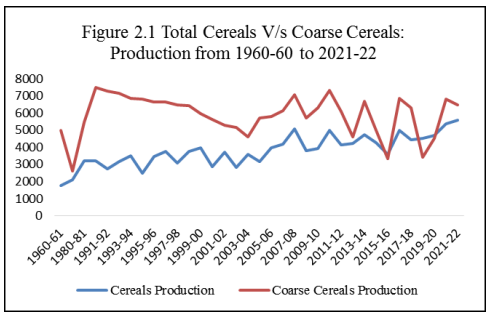
Table 2. Total Cereals V/s Coarse Cereals: Area under cultivation and Production from 1960-61 to 2021-22 (Th. Hectares) (Th. Tonnes)

Year	Rice	Wheat	Cereals	Rice	Wheat	Cereals	Coarse Cereals	
	Area			Production			Area	Production
1960-61	1300	907	2207	1369	401	1770	8399	4985
1970-71	1352	812	2164	1662	440	2102	8156	2635
1980-81	1459	1063	2522	2315	886	3201	8454	5446
1990-91	1581	873	2455	2314	919	3232	8672	7487
2000-01	1511	754	2265	1929	948	2877	7558	5619
2005-06	1515	933	2448	2695	1300	3995	6857	5808
2010-11	1518	1307	2825	2696	2301	4997	6163	7324

2015-16	1503	911	2414	2593	981	3574	5254	3321
2016-17	1535	1272	2807	3110	1875	4985	5683	6850
2017-18	1451	1024	2475	2731	1697	4428	5474	6328
2018-19	1464	834	2298	3276	1249	4525	4129	3421
2019-20	1553	1057	2610	2898	1794	4691	4366	4527
2020-21	1561	1126	2687	3292	2071	5363	4392	6839
2021-22	1575	1132	2707	3435	2144	5579	4345	6483
Source: Compiled from economics survey of Maharashtra 1995-96 to 2022-23								

The production data reveals even more striking changes. In 1960-61, coarse cereals production stood at 4,985 thousand tonnes, significantly higher than total cereals production at 1,770 thousand tonnes. However, by 2021-22, total cereals production surged to 5,579 thousand tonnes around 215% increase in total, while coarse cereals production increased more modestly to 6,483 thousand tonnes around 30% increase in total. This indicates a remarkable improvement in the productivity of total cereals compared to coarse cereals.





Rice cultivation area increased steadily from 1,300 thousand hectares in 1960-61 to 1,575 thousand hectares in 2021-22, showing a relatively modest growth of about 21%. Wheat cultivation, meanwhile, experienced more variability but showed an overall increase from 907 thousand hectares in 1960-61 to 1,132 thousand hectares in 2021-22, representing a growth of approximately 25%. Notably, wheat cultivation peaked at 1,307 thousand hectares in 2010-11, demonstrating periods of significant expansion.

Rice production increased dramatically from 1,369 thousand tonnes in 1960-61 to 3,435 thousand tonnes in 2021-22, a growth of 151%. This outpaced the expansion in cultivation area, suggesting substantial improvements in rice farming techniques and yields. Wheat production showed an even more impressive growth, increasing from 401 thousand tonnes to 2,144 thousand tonnes, representing a 435% increase. This remarkable improvement in wheat production efficiency highlights the impact of the Green Revolution and subsequent agricultural innovations specifically targeting wheat cultivation.

The shift from coarse cereals to total cereals (particularly rice and wheat) reflects broader changes in agricultural policies, dietary preferences, and market dynamics. However, the recent renewed interest in coarse cereals due to their nutritional benefits and climate resilience suggests that future agricultural policies may need to balance the production of both traditional coarse cereals and major cereals like rice and wheat to ensure both food security and nutritional diversity.

Food Security: Origin and Evolution of the concept:

The concept of food security was emerged on the background of efforts of FAO to address widespread hunger and malnutrition in the repercussion of World War II. The initial attention of food security was only on supply of food items to all the people of the country. The availability of food items in the required quantity to the entire population was the only criteria for food security measurement. FAO at WFS held at Rome in 1974 defined food security as, "*Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices"*.

Historically, it was primarily concerned with availability of food to avoid hunger and malnutrition, but over time it has expanded to encompassed a wider range of aspects. FAO in The State of Food Security Report 2001defined as "*Food Security is a situation that exists when all the people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"*. it is a wider and comprehensive definition of food security as it talks about the nutritious, diversifies and healthy food for healthy and active life.

The National Food Security Act enacted by the Indian Parliament in 2013, established a legal framework to ensure food security through subsidized grain distribution to eligible households. The Act primarily addresses three fundamental dimensions of food security: availability, accessibility, and affordability. According to government data, the program currently reaches approximately 813 million beneficiaries nearly 67% of the population.

However, this legislation addresses only partial aspects of the more comprehensive definition of food security established by international organizations such as the WHO and the FAO, which encompasses nutritional adequacy, dietary diversity, and sustainability factors. This limitation poses a challenge to achieving nutrition security, which is essential for a healthy and active life.

Millets and their nutritional significance:

Coarse cereals known as millets contribute significantly to dietary diversity and nutritional security through their rich nutrient profile. These grains contain 7.3-12.5g protein per 100g, with Proso and Foxtail millets offering the highest protein content. Their complete amino acid profiles enhance protein quality, particularly in Brown top millet.

Millets excel in mineral content, with Finger millet providing exceptional calcium (344mg/100g) and Barnyard millet offering substantial iron (15.2mg/100g). These values align with WHO and ICMR recommendations for preventing deficiencies and related health conditions. The carbohydrate content in millets (60.9-75.7g/100g) is complemented by high dietary fiber (up to 12.5g/100g in Brown top millet) and low glycaemic index, making them beneficial for diabetic management and digestive health. Their magnesium content (75-137mg/100g) supports cardiovascular and nerve function, while zinc content (0.7-3.7mg/100g) contributes to immune function.

Each millet variety offers unique advantages: Pearl millet provides potassium and B vitamins for cardiovascular health; Little millet contains antioxidants that prevent chronic diseases; Foxtail millet supplies thiamine for neurological health; and Proso millet contains lecithin for lipid metabolism. WHO and ICMR recognizes significance of millets' in sustainable nutrition security based on their nutrient density and resilience in adverse conditions. The nutritional profile of millets meets and often exceeds dietary recommendations, addressing multiple nutritional needs simultaneously while providing preventive health benefits.

Changing Share of Millets and Traditional Crops in Maharashtra:

Data from the Directorate of Economics and Statistics of Maharashtra reveals a substantial transformation in crop distribution over recent decades. Traditional and indigenous crops have experienced a marked decline, while cash crops have gained significant prominence. Traditional crop cultivation has diminished considerably. Millets, which constituted 17.4% of Maharashtra's gross harvested area in 1980-81, represented only 3.3% by 2019-20. Pulses followed a similar downward trend, decreasing from 7.5% to 2.5% of harvested area during the same period. Oilseed cultivation likewise contracted from 9.1% to 4.4%.

Conversely, cash crops have expanded their footprint substantially. Sugarcane cultivation increased nearly fivefold, growing from 2.2% of total cropped area in 1980-81 to 10.8% by 2019-20. Cotton cultivation rose from 4.8% to 7.4%, while fruits and vegetables more than doubled their share from 2.9% to 7.2%. The state has particularly emphasized horticultural development in recent years. According to the Ministry of Agriculture and Farmers' Welfare, fruit and vegetable production increased from 30.5 million tonnes in 2015-16 to 33.8 million tonnes in 2019-20. During this same period, flower production also grew significantly, rising from 24,000 tonnes to 29,000 tonnes.

Global Scenario of millet production:

According to 2019 data, Global millet cultivation spans 718 lakh hectares, producing 863 lakh tonnes annually. Africa dominates with 68% (489 lakh hectares) of global cultivation area, serving as a staple food crop critical for regional food security. Asia contributes 22.56% (162 lakh hectares) of cultivation area and 24.91% (215 lakh tonnes) of production. India accounts for 19.22% (138 lakh hectares) of global area and 20.05% (173 lakh tonnes) of production. The Americas represent 7.38% (53 lakh hectares) of cultivation area but deliver 22.36% (193 lakh tonnes) of production, primarily utilized for fodder and specialized products rather than staple food. Europe maintains minimal cultivation at 8 lakh hectares (1.11%), while Australia and New Zealand together account for 6 lakh hectares (0.84%).

Analysis of Surveyed data:

The primary survey has been conducted of 400 households of Nanded District to understand their food preferences. According to the survey results, the largest group of respondents, comprising 42.50% households prefer Veg as well as animal-based food. The second-largest group is Pure Vegetarian, representing 40.25%, 161 respondents. This suggests that a substantial number of individuals in the surveyed population follow a strict vegetarian diet, abstaining from consuming any form of meat, poultry, or fish. 17.25% respondents prefer eggs in their food consumption. It underlines the significance of millets consumption to balance the nutritious requirements of the majority of households amongst the surveyed households.

Table 3. Food Preferences

Food Preferences	**No of Respondents**	**Percentage**
Pure Vegetarian	161	40.25%
Eggetarian	069	17.25%
Veg and non-vegetarian	170	42.50%
Total	**400**	**100.00%**

Source: Primary Data collected through Questionnaire

According to the survey data, the majority of families, accounting for 51.25% or 205 households, consume between less than a litre of milk per day. The 34.75% or 139 families take

even less than half litre of milk per day. It clearly shows the insufficient and less than recommended intake the basic food items in daily consumption of surveyed households.

Conclusion:

Analysis of Maharashtra's three-decade agricultural trends reveals that the food security is negatively impacted by shifting cropping patterns, with production moving from staple cereals to non-food grains, threatening nutritional availability. Economic considerations outweigh geographical factors in farmers' decisions, with market dynamics and profit potential taking precedence over environmental sustainability. Indigenous cereal cultivation has declined significantly, reducing crop diversity and potentially compromising nutritional security. Maharashtra's agricultural transformation has supported economic growth but compromised nutritional balance, food equity, and ecological stability. Future policies should incentivize traditional cereal cultivation to restore balance. Diversifying rural economies through livestock, food processing, and skills training reduces agricultural dependency. Nutrition must be integrated across agricultural, health, and rural development policies including food security act, emphasizing dietary diversity and quality. Indigenous crop varieties with superior nutritional profiles should be preserved through community seed banks. Diversifying the Public Distribution System with pulses and millets would benefit vulnerable populations. Promoting millet value-chains through production incentives and market development supports nutritional security. Addressing climate variability through crop insurance and diversification reduces risk, while gender-sensitive approaches are essential as women face disproportionate food insecurity challenges.

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