Food Fortification Initiative
Enhancing Grains for Healthier Lives

Summary report on supply chain analysis & opportunities for wheat flour fortification in Maharashtra

Prepared by the Food Fortification Initiative (FFI) for the Rockefeller Foundation

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14-July-2023

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Note to Readers

The report provides a general understanding of the landscape & cereal grain supply chain for proposing fortification in the Indian State of Maharashtra. The report is prepared with a combination of desk and field research. The content report is an extracted summary. For specific requirements, the readers are requested to contact the principal coordinator for any specific details of such information.

This report was made possible through the generous support of the Rockefeller Foundation.

How to Cite this Report

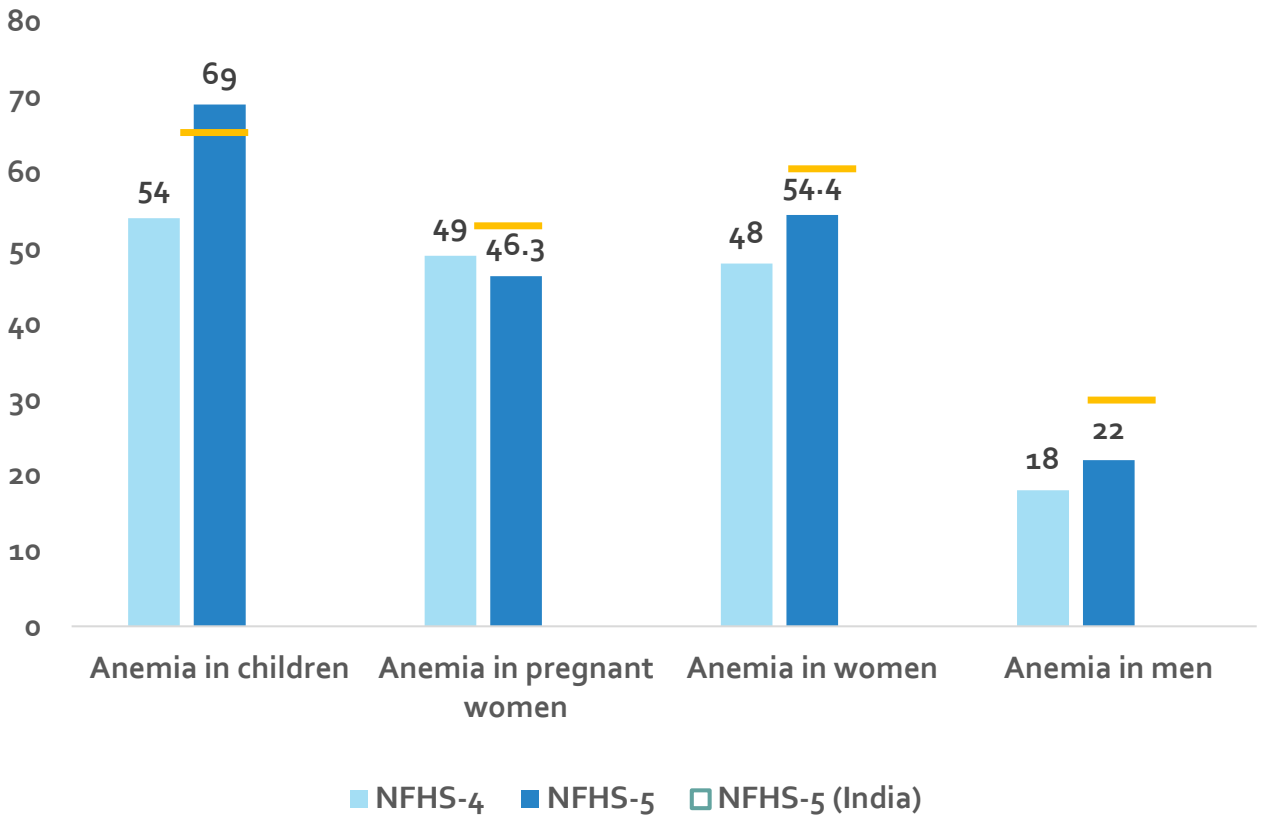
Food Fortification Initiative. Summary report on supply chain analysis & opportunities for wheat flour fortification in Maharashtra. FFI: India, 2023.

1. BACKGROUND

1.1 Opportunity Identification

Maharashtra is the third largest state in India with diversity in almost every aspect of the supply chain and a varied stakeholder base of producers, consumers, support industries, and systems. The state covers an area of 307,713 km2 and it can take a grain delivery truck more than a day to travel from one end to another. Maharashtra is also one of the most industrially developed states in India. Large-scale industrial development has brought in a large migrant population whose food consumption behavior varies significantly from others in the state. This has led to significant nutritional diversity and consumption patterns. Additionally, the state has several areas where access is limited or restricted including the tribal areas of Jawahar and Makhoda, which are slightly north of Mumbai; insurgent-controlled areas in the eastern region covering Chandrapur and Gadchiroli bordering Telangana and Chhattisgarh; and mountainous, hard-to-access areas in the Konkan region.

PREVALENCE OF ANEMIA IN MAHARASTRA, 2002



According to Community Genet (2002; 5:192–196), 1 out of 2 women and 2 out of 3 children in Maharashtra are anemic, a significantly higher prevalence of anemia than other states. Maharashtra also has some of the highest rates of neural tube defects (NTDs) in India. These statistics do not include limited/restricted areas in the state that have little to no health monitoring data; as a result, the actual burden of micronutrient deficiencies in the state may be much higher. Despite Maharashtra's overall industrial and economic development, micronutrient deficiencies and their health consequences are still a pressing public health issue for the state.

Large-scale food fortification, particularly that of a whole-grain wheat flour called atta, is a long-term, self-sustaining, and feasible nutrition intervention that can help reduce micronutrient deficiencies in the state. To implement fortification effectively, a thorough understanding of the state's cereal grain supply chain, consumption patterns, as well as potential opportunities and challenges for fortification are needed.

1.2 Proposition and Objectives

Given the complexity and multitude of challenges in Maharashtra, any fortification program will need to consider multiple factors to bring together and address the needs of diverse stakeholders. This supply chain analysis therefore is not only a strategic assessment, but also a tool for continuous development during implementation of the program.

Objectives:

- Create a significant health impact by addressing anemia and NTDs in Maharashtra through the optimal use of fortification vehicles and channels that can be sustainably scaled and streamlined in the supply chain.

- Explore and identify feasible channels for fortification in the supply chain and craft solutions that are tailored to various regional or segmental needs.

- Prepare an implementation framework that takes into consideration the opportunities and challenges discussed in section 1.1.

1.3 Rationale and Justification

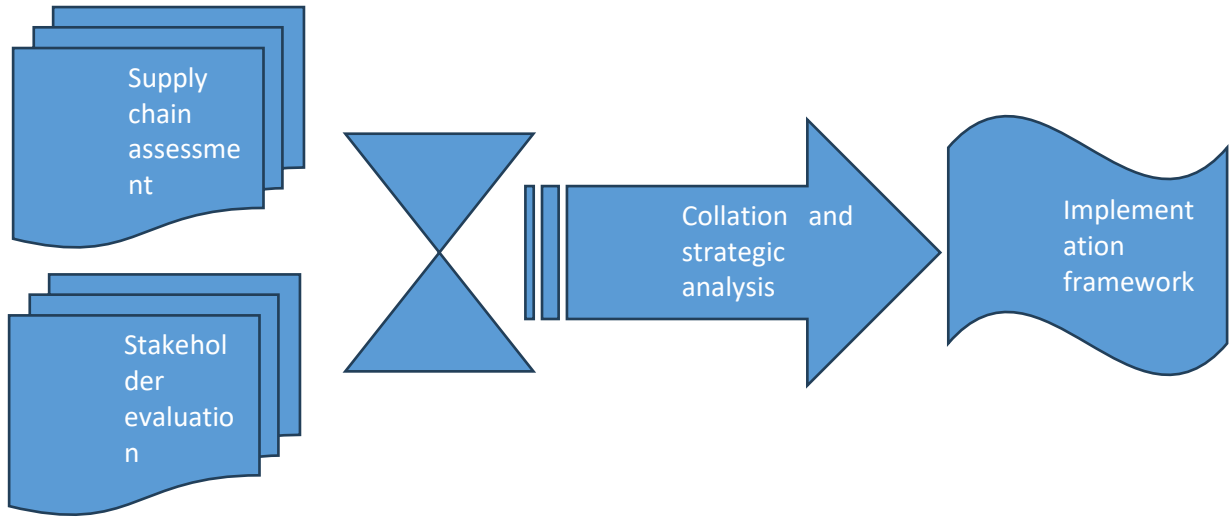
Though the Food Fortification Initiative (FFI) has been providing technical assistance on fortification in Maharashtra since 2019, progress has been slow. Maharashtra has been plagued by a series of challenges in recent years, mainly at the state government level. Following state assembly elections in 2019, there were delays in the formation of a government cabinet and, once formed, frequent changes in leadership roles. During the COVID-19 pandemic, Maharashtra had some of the highest caseloads and deaths in India; as a result, keeping the pandemic at bay became the state's priority over other public health issues like nutrition and fortification. Though the Maharashtra Public Distribution System (PDS) carried out a small pilot atta fortification project in the South Mumbai region from 2017 to 2018, the program did not result in an operational scale up. With a new cabinet formed and the COVID-19 pandemic waning, there is an opportunity to re-engage with the government and explore fortification.

Combining the ongoing experience of implementation and evidence of fortification's health impact in Haryana with local knowledge of the state's cereal grain supply chain and working modalities will help map a realistic way forward for public, private, and civic stakeholders to have a tremendous impact on health in the state through fortification. Consistent and evidence-based technical assistance, particularly that which is provided to public stakeholders, will be important for the success of a fortification program.

The following FFI supply chain analysis presents a framework to address the needs of Maharashtra fortification stakeholders and, in turn, address the health needs of those most vulnerable to micronutrient deficiencies.

2. METHODOLOGY

2.1 Study Framework



To better understand the opportunities and challenges presented in dealing with a complex state like Maharashtra, FFI assessed key public, private, and civic stakeholders. When combined with the assessment of the state's cereal grain supply chain, this report provides a framework for implementation.

2.2 Analysis

With the complexity of Maharashtra's supply chain, two types of analysis are warranted.

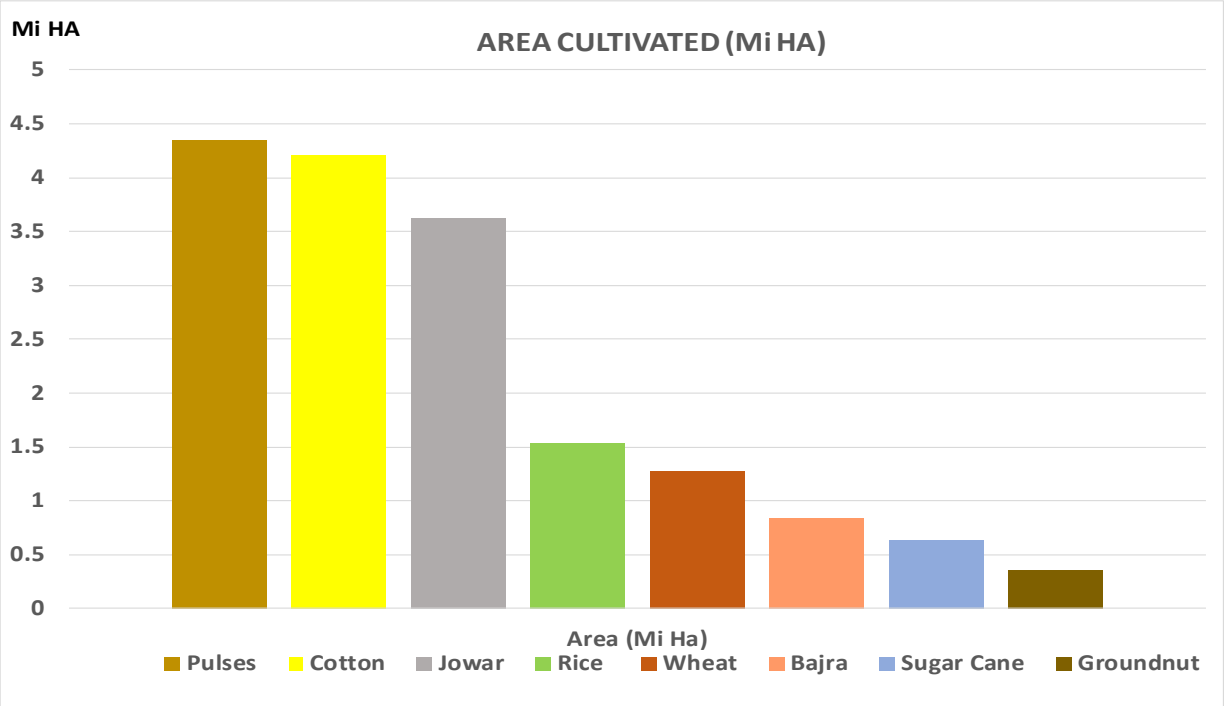
Supply chain analysis: An assessment of the overall landscape and the operating environment of the cereal grain supply chain system covering production, processing, consumption, support industries, capacity of enabling industries such as laboratories, and other facilities.

Stakeholder evaluation: An evaluation of public, private, and civic stakeholders to learn from past attempts at fortification in the state and anticipate future challenges. The assessment includes feedback from PDS beneficiaries that received fortified food in the past.

3.0 OBSERVATIONS

3.1 Production

Maharashtra produces several types of crops. It is one of the leading suppliers of pulses in India and the dry arid zones of Maharashtra where pulses are grown have been a significant source of income to the farmers. Other commercial crops such as cotton and sugarcane have also been profitable for farmers in the state. Jowar (sorghum) and bajra (pearl millet) are the state's main cereal crops, with rice and wheat taking a low priority in production.



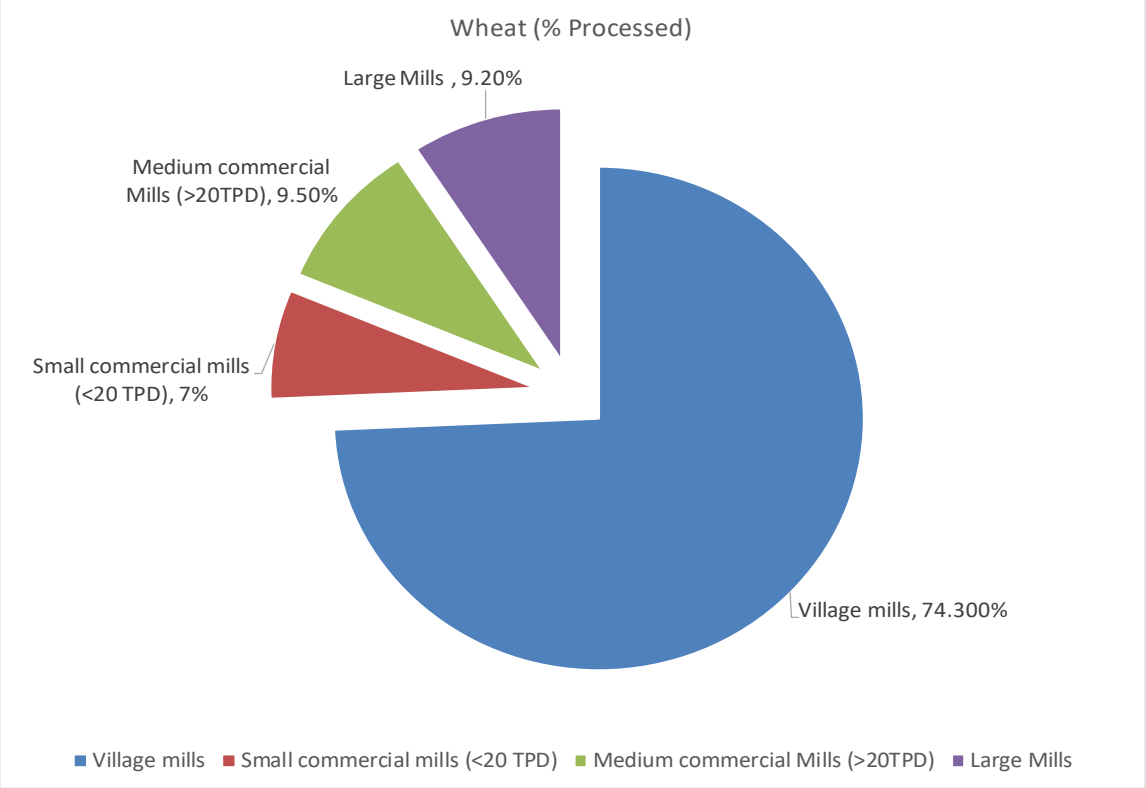
As a result of its low levels of wheat and rice production, the state relies on imports to support its high rates of wheat and rice consumption. There is a large industrial presence in the state that mills wheat and rice for consumer markets. As Maharashtra's wheat and rice availability is dependent on other states, there is considerable volatility and sensitivity with respect to food policies connected to agriculture, such as fortification.

To create fortification standards and legislation, the Maharashtra government will need to consult with concerned stakeholders to gain consensus on food policies. Therefore, there will be a need to engage with and harmonize priorities among leadership from the Ministries of Agriculture, Health, Food, Industries, etc… inside and outside of Maharashtra.

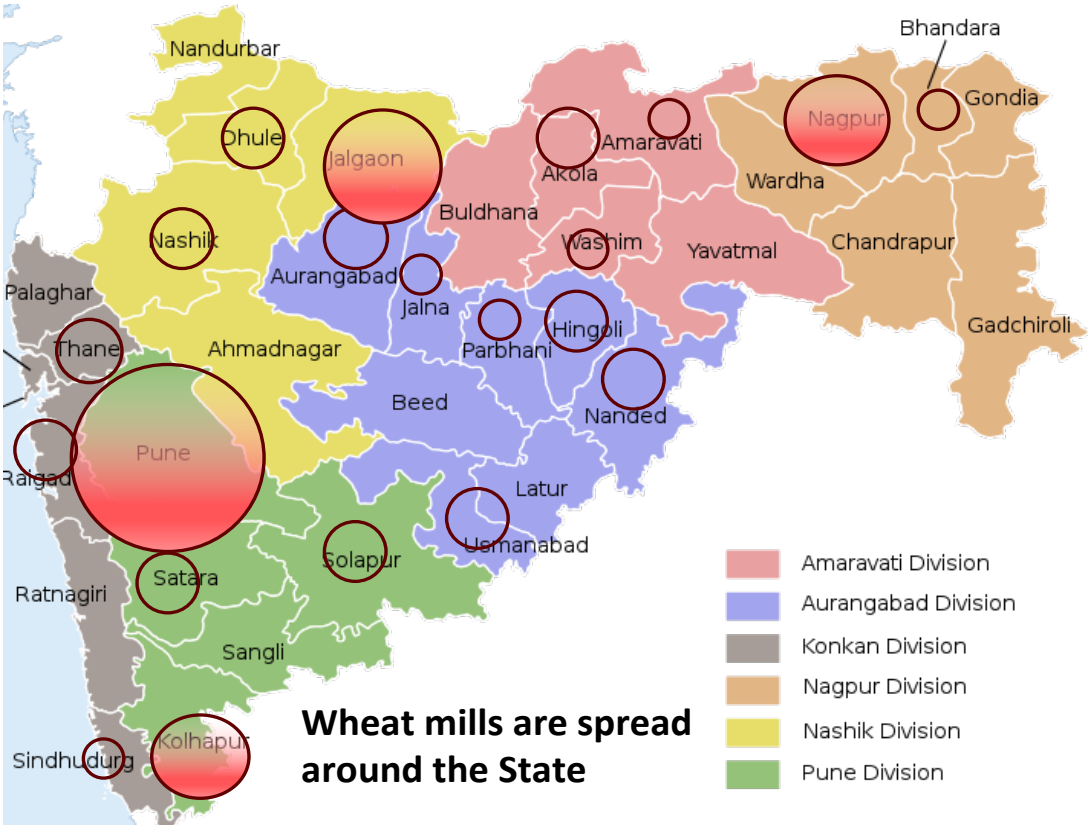
3.2 Processing

Wheat Flour

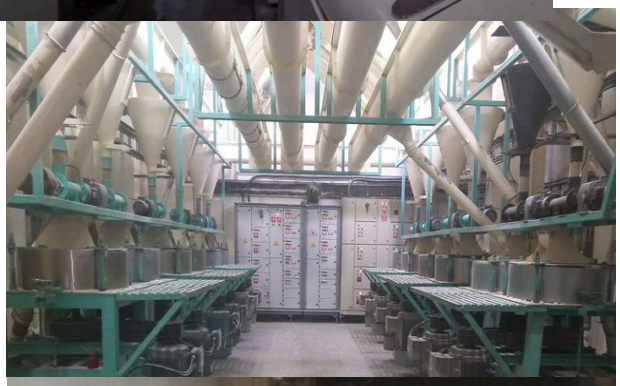
The large offtake of wheat through PDS (mainly sourced from neighboring Madhya Pradesh) and purchase of indigenous wheat by locals has resulted in many people turning to small chakki (stone-ground) mills to grind their wheat into atta. Large commercial mills in the state primarily process maida (highly-refined wheat flour), though mills with the ability to produce chakki atta exist.



Key processing regions in the state for wheat flour are Mumbai-Pune, Jalgaon, Nagpur, and Kolhapur. There are also large mills in the Solapur, Nanded, Washim, and Aurangabad regions. Most of the mills operate with an average utilization of about 50-55% and most have spare capacity to accommodate additional processing.



Maharashtra has large-scale, fully laid out chakki and roller mills that can produce large quantities of wheat flour. In total, there are about 80 functional large-scale wheat flour mills in the state. Wheat flour mills in Jalgaon and Pune target the Mumbai market, mills in Nagpur and Nanded target the Hyderabad market, and mills in Solapur and Kolhapur target the Bangalore market for maida. Atta production is a subset of the total amount of wheat flour milled, but atta production caters to the local market. The imposition of the Goods and Services Tax on branded atta has discouraged many millers from producing atta.



Wheat flour millers can benefit from and are looking for additional demand to mill products such as fortified atta and utilize their excess capacity.

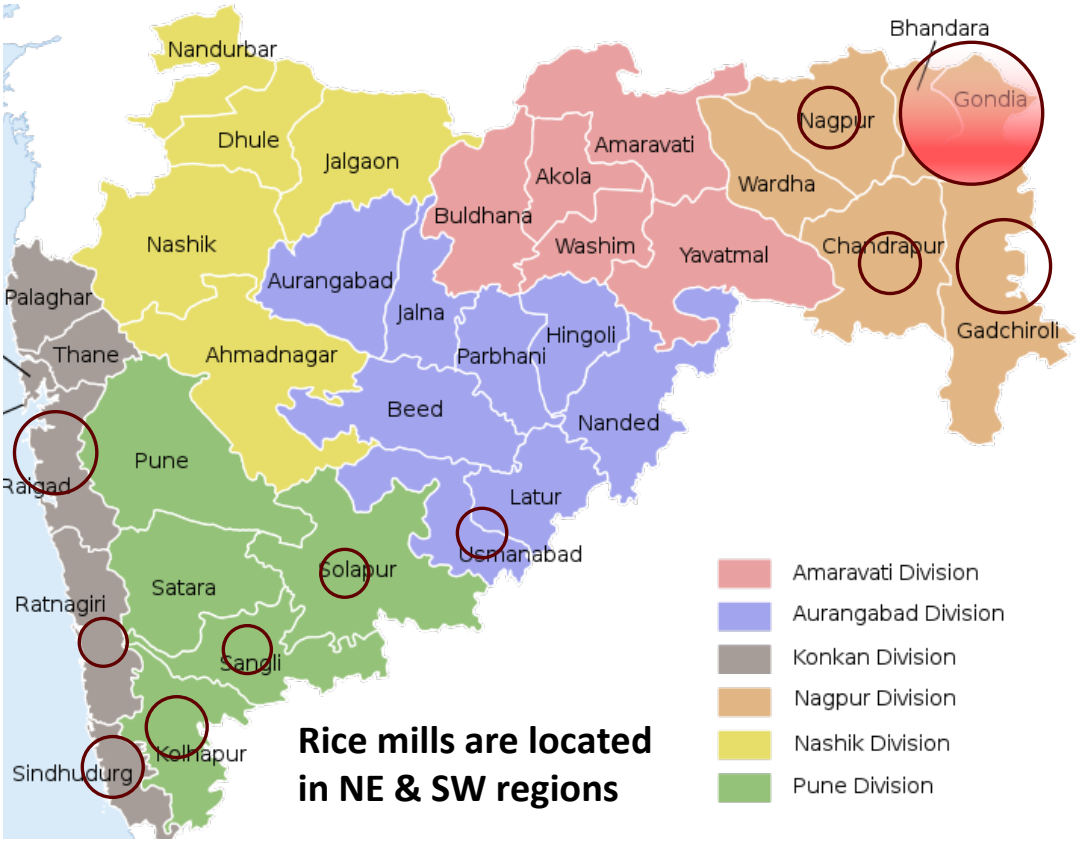
Vertical chakki mills are very commonly found in villages. The grinding charges vary from about 4 Rs/kg in rural areas to about Rs 6 in urban areas. High grinding costs can be attributed to the very fine level of granulation demanded by consumers compared to other parts of India. Vertical chakki mills also produce a specific quality of atta that is preferred by consumers for making a special kind of chapatti (bread) like thepla. Generally, high-quality wheat is ground in these mills as well.

Commercial chakki mills are also found in the state, however they are not highly prevalent. These mills use horizontal chakki machines bought from Punjab or Haryana and produce a coarse atta that is primarily sold to hotels and the food service industry. Household consumers generally prefer atta milled by a vertical chakki. However, consumers are gradually accepting less expensive atta milled by horizontal chakkis. Vertical chakkis, which can produce about 50 kg/h of atta, have a higher cost of operation than horizontal chakkis, which can produce 200-250 kg/h of atta.

Rice

Rice mills are concentrated in specific regions of the state. The region around Gondia offers a large cluster of rice mills that process high quality rice such as Kollam (sold in South India). These

varieties fetch a premium price above Rs 60/kg.



The Wainganga River Project near Bhandara has been a boon for increasing rice production in the region. The Konkan region also grows rice, processing it in small mills for local consumption. The southern and southeastern regions of the state also have rice mills where paddy rice is procured from neighboring Karnataka or Telangana States and processed mainly for the Mumbai market. These mills are large-scale with state-of-the-art technology.

A modular rice mill.

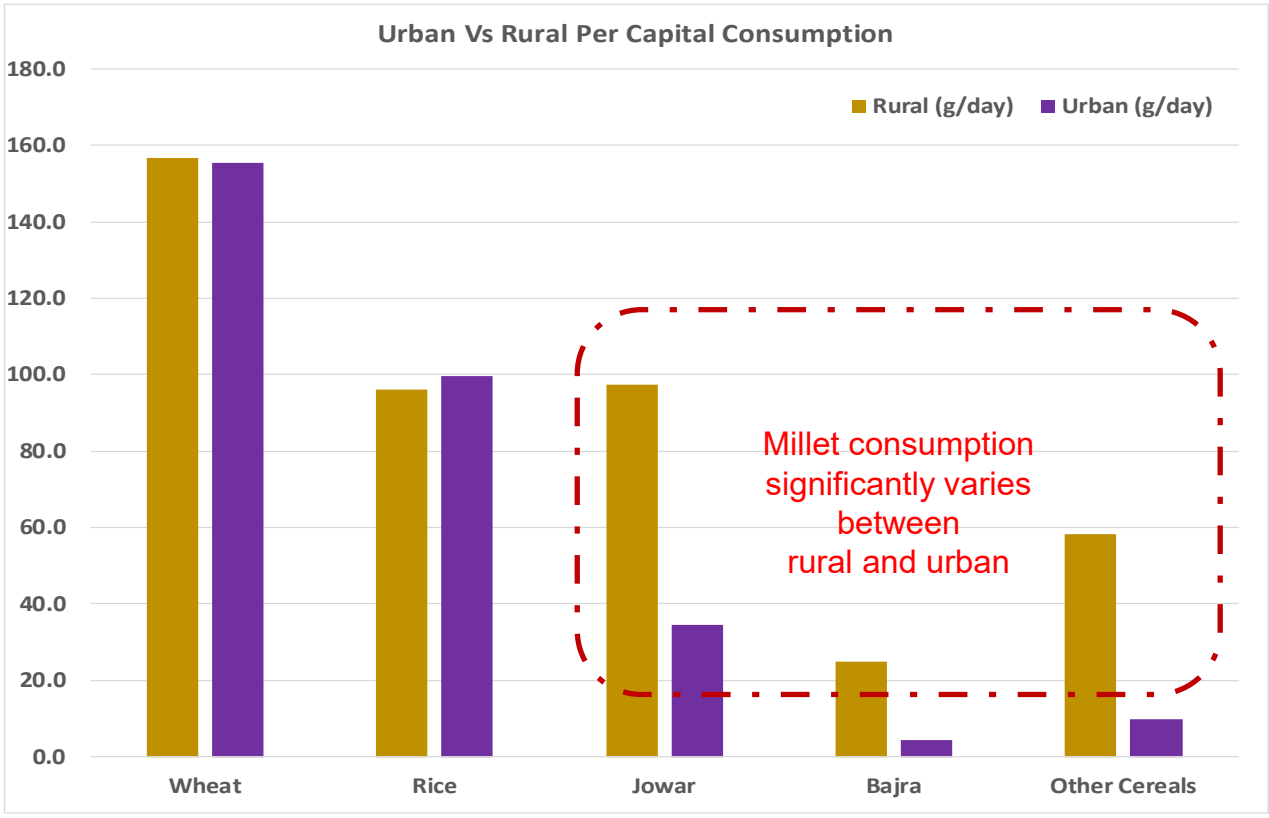
Except for the Konkan region, where mills are still rudimentary (shown in the picture to the right using huller mills, a very old system of rice miling), rice mills in Maharashtra are indutrial and employ state-of-the-art technologies. However, unlike wheat flour mills, rice mills are absent from many parts of the state and consequently pose logistical challenges for moving rice between districts.

The introduction of rice fortification is relatively easy from a milling perspective; however, distributing fortified rice to beneficiaries across the state would pose logistcal challenges and require transportantion over great distances.

Other Cereal Grains

Jowar is not yet processed on a commercial scale although a few brands have started entering the market. Small chakkis in villages are commonly used to grind jowar and bajra.

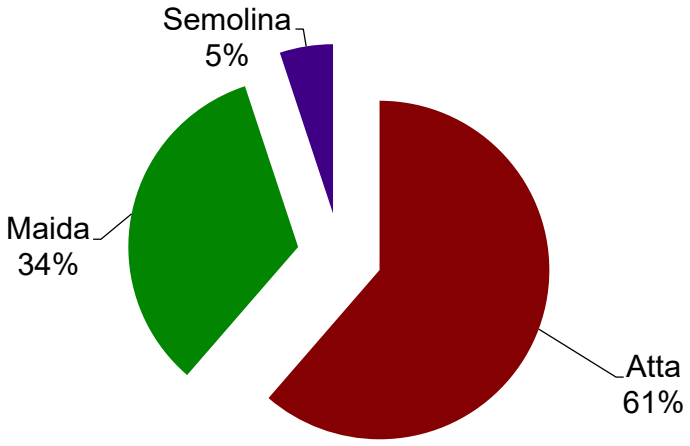
3.3 Consumption



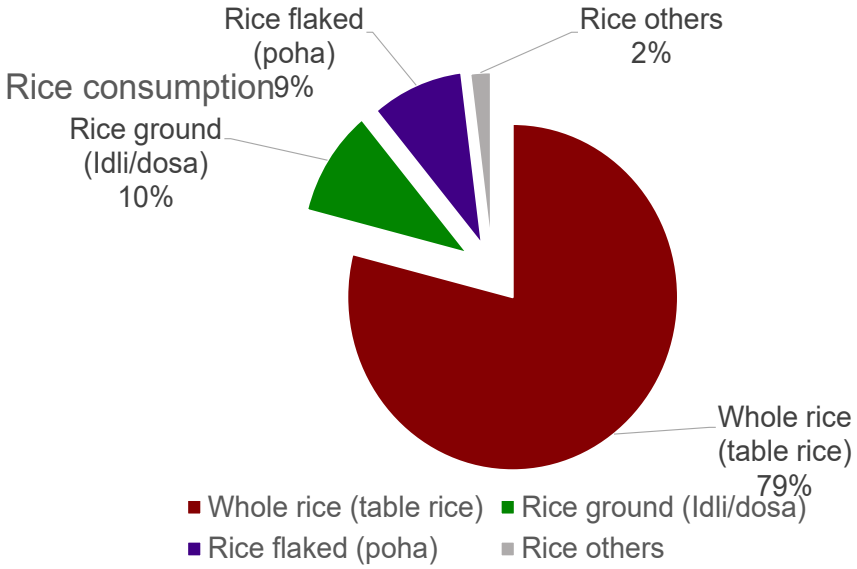
(Source: Deshmukh et.al.2018).

Wheat is Maharashtra's most consumed cereal grain and is widely consumed across the whole state. While there is preference for jowar in the southern districts, the urban demand for wheat and rice is significantly higher.

Among wheat products, atta is widely consumed making it the best choice to reach the entire state with more than 150 g/person/day of consumption.



Consumption of jowar and rice is almost equal, averaging about 70 g/person/day. Rice is consumed in similar amounts in both rural and urban areas whereas jowar is predominantly consumed by rural populations. Rice is relatively less preferred than wheat flour, however the consumption of flaked rice for breakfast is a speciality in Maharashtra. Rice can be regarded as a major cereal; however, consumption in various forms like flaked, ground etc. brings down the consumption of the type of rice that could be fortified to about 50 g/person/day.

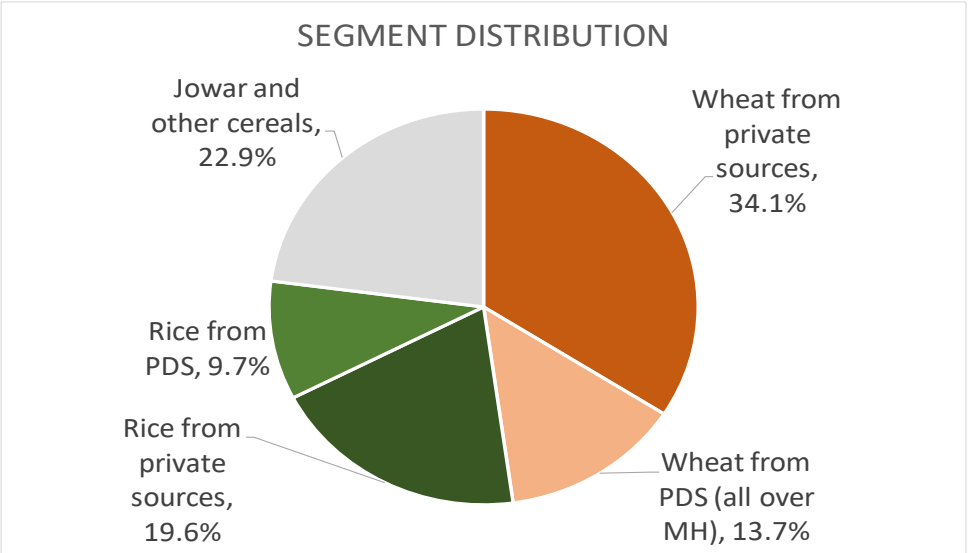


Wheat flour, atta in particular, outweights all other cereals in reaching almost the entire population of the state.

4.0 CONCLUSIONS

4.1 Opportunity Segments

The large opportunity segments for cereal grains are presented below.



Fortified atta available through PDS provides the largest opportunity for reach. Though wheat available on the open market (from private sources) has the largest segment of total consumption, a significant portion (around 50%) of this wheat is bought by consumers and milled in small chakkis and is not accessible for industrial atta fortification. Furthermore, most of the industrially milled wheat sold on the open market is produced as maida.

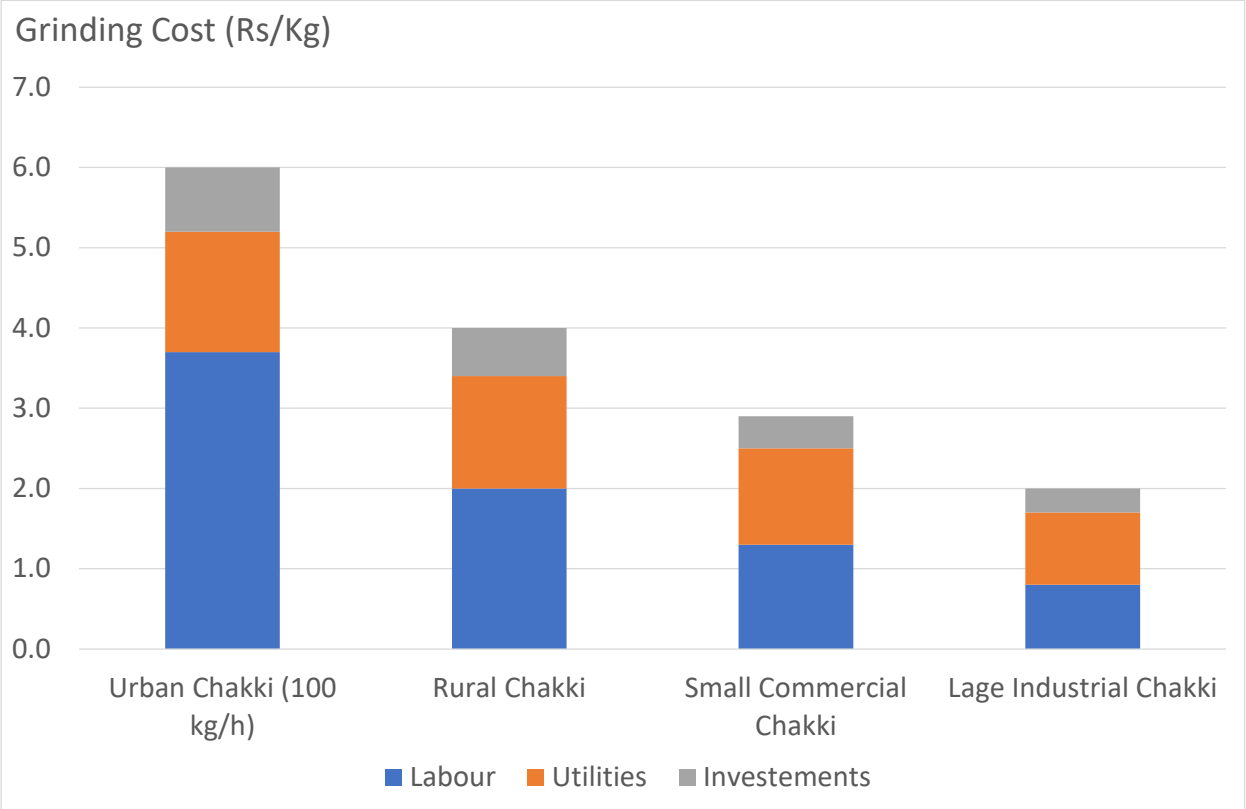
About 70% of jowar is milled and consumed by the farmer who grew it or sold in local markets, both segments that do not reach industrial scale.

Rice available through PDS as well as on the open market (from private sources) are mainly industrially milled, making it a feasible option for fortification.

Conclusion 1: PDS atta is the best food vehicle to fortify and reach the entire state.

4.2 Feasibility Assessment

Wheat milling costs in Mumbai and the surrounding region is very high at more than Rs 6/kg; milling is less expensibe in rural areas at aroud Rs 4/kg. The high cost of milling in the Mumbai area can be attributed to high labor and operational costs. When totaled with the cost of wheat grains bought through PDS, PDS beneficiaries in the Mumbai area may spend more than Rs. 9/kg on atta.



From 2017 to 2018, a small pilot project was conducted in Southern Mumbai to understand the feasility of providing fortified atta through PDS. The benificiaries were charged Rs 9/kg for fortified atta through PDS. However, before the project, benficiaries received whole wheat grains for Rs 2/kg. The cost increase was too high for beneficiaries and unnecessary for full cost recovery by the government. The pilot was rejected by beneficiaries and stopped.

If PDS and other social protection programs instead distribute industrially milled and fortified atta, the total cost of atta for beneficiaries will decrease and the provision of atta will be cost-neutral for the government. The lower costs of production that can be achieved with scale will substantially bring down the cost to the beneficiary and overall milling cost inclusive of fortification could be well below Rs 3/kg.

While the overall costs make economic sense from a milling perspective, the packaging size of PDS distributions—which is a custom size of 3 kg distribution per month—should be reconsidered to further reduce cost. FFI recommends that fortified atta is packaged in 5 kg, 10 kg, or 20 kg bags to the lower cost of packing per kg. In response to beneficiary feedback, FFI also reccommends that the fortified atta's production and packaging support a shelf of up to 3 months.

Conclusion 2: Supplying fortified atta through PDS is feasible under the following conditions.

a) Engage large-scale mills that can fortify and lower the overall production costs.

b) Adopt standard packaging sizes and use bag material that that supports a shelf of up to 3 months.

c) Control moisture through production and packaging to ensure shelf life of up to 3 months.

4.3 Strategic Analysis and Recommendations

The recommendations below are based on a 4-parameter scale to facilitate the development of an implementation framework.

Availability and Accessibility

Wheat is available through PDS and on the open market; however, recent trends show a decline in wheat supplies due to increased prices. Some consumers are replacing their wheat consumption with rice. As Maharashtra is a part of the national government scheme to distribute fortified rice through PDS, offering fortified rice and wheat depending on availability will be complementary and ease price fluctuations or shortages of either grain.

As most rice is milled industrially, supplying fortified rice can be prioritized by social protection programs if milling and supplying industrially milled atta is too great a challenge in remote areas.

Acceptability

Beneficiaries demand high quality products in Maharashtra. The provision of fortified wheat flour or chakki atta can be acceptable to beneficiaries if it is of high quality. The wheat grains supplied through PDS are generally considered low quality by beneficiaries. Processing protocols can be adjusted to improve quality.

Suitability

Wheat flour is the most suitable vehicle for fortification in Maharashtra with an average consumption above 150 g/person/day. However, this is half the consumption of a typical wheat eating state like Haryana. FFI recommends that the Government of Maharashtra create fortification standards in line with World Health Organization recommendations in order to have a

positive health impact on the population.

Sustainability

With reduced milling costs covering the additional costs of fortification, wheat flour fortification is the only sustainable option available currently. If another cereal grain product such as jowar can be industrially processed at lower costs, then it could be considered as a feasible food vehicle for fortification. Rice fortification needs to be externally funded and hence is not self-sustainable. While fortified rice can be of short-term solution, wheat flour fortification is a long-term sustainable approach.

4.4 Short-Term Strategy

Creating a success story to win the confidence and comfort of the stakeholders is key to operationalization of fortification. As rice fortification already exists in the state on a small scale, it will provide a foundation for fortified atta. Stakeholders should consider starting the distribution of fortified atta though small social protection programs like the Integrated Child Development Scheme (ICDS) or mid-day meal program (PM-POSHAN) to establish operational feasibility before moving to PDS.

5.0 References

Data on production is sourced from Government of Maharashtra (2019-20).

Supply chain industry sections visited:

- Amaravati flour Mills - Amaravati
- APMC - Mandi (Deglur)
- APMC - Mandi Latur
- Bajaj Rice Industries - Sindhudurg
- Balaji Flour Mill - Nagpur
- Bhandara -Cluster visits covering 6 mills
- Dept/Institute of Food Technology - Pharbani
- Gondia (along with a cluser of about 12 mills visited)
- Kedarling Flour Mill - Kohlapur\
- Kohinoon Flour Mill - Namded
- Kohlapur- Cluster visit covering 5 mills
- Mahaalakshmi Flour Mill - Kohlapur
- Mandar Flour Mills - Satara
- Matoshri Chaklki Mill - Pune
- Nanded Roller Flour Mill Pvt Ltd Nanded
- Parag Foods - Pune
- Pune Roller Flour Mills - Pune
- Raigad - Cluser visit covering 5 mills
- Ratnagiri - Village huller and cone mills
- Sanghvi Foods - Mumbai
- Satara Flour Mills - Satara

- Shivaji Roller Flour Mills - Mumbai
- Siddheswar Flour Mills - Solapur
- Star Rice Mill - Sangli