



Policy Brief

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ICAR-NAARM under the aegis of Indian Council of Agricultural Research (ICAR) is serving the country since 1976. It is primarily mandated with the capacity building of different stakeholders engaged in National Agricultural Research & Education System (NARES) in India. Over the years, the Academy has grown in its mandate and vision, and currently operates with its six functional divisions: ABM, ESM, HRM, ICM, XSM, and RSM. The Academy has been serving as a Think Tank for the ICAR as well as Agricultural Universities in India.

To deepen the engagement with various stakeholders in the agriculture sector, the Academy is starting a quarterly series of Policy Brief. The first issue of the series is covering one of the most important challenges in Indian agriculture i.e. marketing, and recommends innovative market model to provide level playing field to the smallholders and sharecroppers in India. The proposed market model viz. Smart Micro-Mandi envisages use of concept of E-NAM alongwith the application of Internet of Thing (IoT) and Artificial Intelligence (AI) to drastically reduce the price and market risk of the smallholders and sharecroppers. It also promises to provide level playing fields to all the farmers, with better price discovery.

Looking forward to your feedback.
Warm regards,

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Smart Micro-Mandi: For Better Price Realization and Reduced Market Risks for the Smallholders

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Introduction

Since last seven decades, every sector and sphere of life in India has changed in profound ways, except the way small and marginal farmers have been marketing their farm produce. Most of them still sell their produce to village traders or at local market at much lower price than what final consumers pay for it. The existing *mandi* system (regulated market) has been mostly self-serving or serving their masters, instead of its clients viz. farmers. The market participation of smallholders (small & marginal, landless & sharecroppers) in the existing *mandi* remain poor due to long distance of market, their uneconomic lot sizes to transport, time consuming process at *mandi*, varying quality of produce, and interlocking with village traders for financial needs. Therefore, there is urgent need of disruptive and innovative change in agricultural market to ensure level playing field for all the farmers. In April 2016, the Government of India launched an ambitious scheme of creating electronic platform for national agricultural market, known as E-NAM and so far, connected 585 regulated markets across major states. However, the inherent weaknesses in implementation of E-NAM has left sort of the desired results. The present brief gives a conceptual framework of new market model i.e. **Smart Micro-Mandi (SMM)**, which envisages combination of E-NAM platform, strength of JAM (Jan Dhan account, Aadhar & Mobile) and application of modern technology like, sophisticated camera & sensors, artificial intelligence (AI) and Internet of Thing (IoT). Such *mandi* would be agnostic to land-size. It has capability to offer multiple benefits to the farmers by compressing the value chain, minimizing role of middlemen, efficient price discovery, and most importantly reversing the market risks for the smallholders.

Features of Smart Micro-Mandi

The proposed Smart Micro-Mandi (SMM) includes **five strategies**:

- a) **Milkization of agricultural commodities**: after assaying & grading, pooling together similar produce (like liquid milk market) of all the farmers in the catchment area;
- b) **Dematerialization of agricultural commodities**: converting the agricultural produce into small units like demat, and crediting units into the respective farmer's virtual account;

c) **Instant partial payment based on warehouse receipt:** seamless integration of farmers' bank account with financial institution to make instant partial advance payment to the farmers against the produce deposited in the warehouse, and;

d) **End-to-end digitalization:** use of optical scanner & sensor, IoT, cloud computing, artificial intelligence, online bidding, etc. to capture all the information on real-time basis to all the stakeholders.

e) **Proximity to the farmers:** the SMM is proposed to be set up in the radius of 5-6 km, thus catering to an area of about 100 sq.km. It would attract all the farmers to participate in the formal market in expectation of better price discovery. Having the catchment area of 100 sqkm and excluding the districts with very low population density (<100 persons/sqkm), there is need of **28,200 Smart Micro-Mandis** in India (see the Annexure for state-wise spread).

Moreover, all the above processes & services are already in operation in India in different forms, but at higher level in the value chain. The proposed model joins these dots together and bring it to the lowest level at the door of small and marginal farmers, who can taste the benefits of these technological advancement in India.

Conceptual Framework of SMM

The architecture and workflow of SMM is given in the figure 1. There are five essential components in the SMM: 1) Assaying & grading technology, 2) JAM for all the farmers, 3) Financial institution, 4) Modern warehousing facility, and 5) Digital platform for transaction.

As depicted in figure, the *mandi* would function in 9 stages. Those are- **1)** All the farmers in catchment area would be registered using *Aadhar*, Mobile & Bank account. Irrespective of lot sizes and quality, all the farmers would arrive at SMM with his/her produce. Since the SMM is at 5-6 km radius, it may be expected that most of the farmers in the catchment area would be cultivating mainly 2-3 major crops. **2)** The produce passes through quality check. Initially with maximum 3-4 quality standards (moisture, grain size, broken grain & admixture), the produce is categorised in Grade-I, II or III. **3)** The produce of all the farmers are pooled together across these 3 grades (*milkization*). **4)** Then, the entire lot of each farmer is standardized into small units, say each kg of grain is equivalent to 1 Unit. Accordingly, farmer's virtual demat account is credited with number of units (*dematerialization*). **5)** The deposits of the produce would trigger the financial institutions to credit the partial payment to farmer's account, say the value of 1/3rd of the produce deposited in warehouse by each farmer. This would be helpful for the farmer to meet the immediate

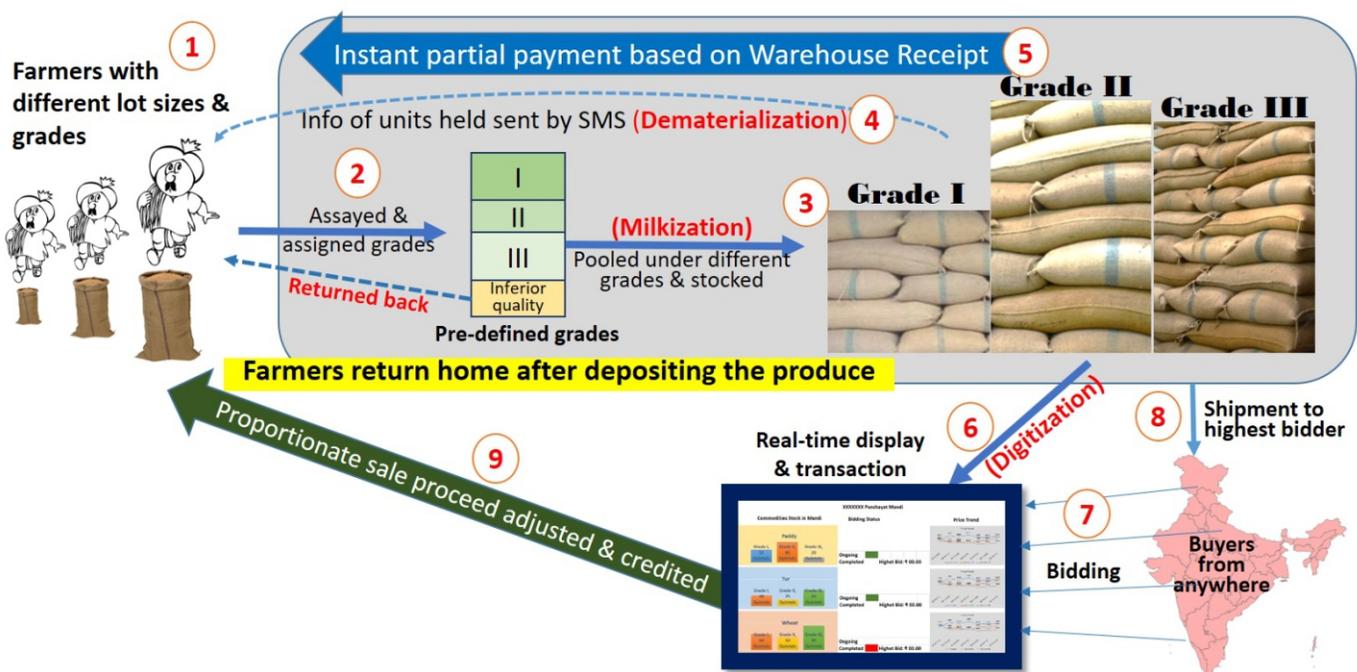


Figure 1: Architecture and workflow of Smart Micro-Mandi

cash need. 6) The information of entire deposits of the agricultural produce under different grades would be available transaction platform. Individual farmer may also stagger his sale as per his/her requirement and market condition. Using the advanced computing methods and sophisticated algorithms, the detailed information about the quantity of the produce under different grades would be adjusted and reflected on the dashboard. 7) The bidders from any part of the country may bid for the particular grade of the produce. The information of the highest bidder in each SMM would be sent to the warehouse of the respective SMM. Thus, the existing trend of oligopsonistic condition of too many seller-farmers and few buyer-traders would be reversed as single seller i.e. SMM and more buyers. 8) With the help of third-party logistics already registered with each SMM, the quantity of the produce would be despatched to the winner-bidder, after deposit of the amount. 9) The final payment to the farmers would be made according to the proportionate share of each farmer in each day's sale proceeds after adjusting the initial advance payment made.

Edge of Smart Micro-Mandi over Existing Marketing System

- **Market participation of small-holders and sharecroppers:** The proposed SMM being within 5-6 km, possibilities of participation of all the farmers are very high. This would aggregate huge quantity of produce even for remotely located SMM.
- **Better price discovery & realization:** Since the details of quality and quantity of each commodity is available on real time, large number of buyers, including Government (for social safety programmes) and individual consumer can participate. This would result into better price for each farmer by removing the role of middlemen.
- **Reversing the market & price risk impact:** In the existing marketing system, individual farmer has the responsibility to sell his produce. Due to this, market and price risk are large for the smaller lot size, as it attracts last attention of the buyer-traders. In the SMM, the commodity being defaced with the farmers after deposit, the marketing of the aggregated produce has to be managed by the professionals. Therefore, the smallholders would face smaller market & price risk in proportion to their share. Further, there will be more number of buyers than the sellers (SMM), thus improving the bargaining power of the farmers.

- **Provision of staggered sale by the farmers:** The SMM would offer the provision to even marginal farmers with very small lot size, to plan the sale of their produce, instead of selling entire produce at the time of harvest season, when prices are low.
- **Upfront advance payment to the farmers:** The SMM would have in-built provision to make advance partial payment to all the farmers, once their produce passes through quality check and handed over to the warehouse.
- **Huge time saving for farmers:** After assaying & grading done, the farmers have no role in the mandi. They can return back to their home, unlike current system, where farmers need to wait whole day, till their tiny lot is sold.
- **Reduced scope of moral hazards:** Current marketing system has no disincentive of moral hazards by the market players. In the SMM, the information flow would be end-to-end digitized and shared on real time basis. Therefore, the manipulation at any level can be significantly minimized/controlled.
- **Ease in implementing assaying & grading:** Each SMM being in the radius of 5-6 km, the probability of having only 2-3 major crops in the catchment of each SMM is very high. Therefore, developing technologies of faster and accurate quality assaying would be much easier, as compared to current E-NAM *mandis*, where huge number of lots of different commodities arrive during harvest season. This becomes unmanageable for assaying quality of all the lots on same day.
- **Ensuring Minimum Support Price (MSP) to all the farmers:** Since, most of the farmers, irrespective of having own land or not, would deposit their produce in expectation of better price, all the production data in the region would be automatically captured. This would facilitate the Government, if it intends to ensure MSP to all the producers. The SMM being at local level, peer pressure would also eliminate the entry of fake farmers in the system.

To conclude, micro-*mandi* near to the farmers and integrated with the secure advanced technologies is the way to reduce the agony related to market manipulation and low price realisation of the smallholder farmers in India. Initially, each SMM may begin with less perishables like, cereals, pulses & oilseeds, later on high value perishable fruits & vegetables may also be added. Each SMM may become profitable by charging very little service charge, which can also incentivise the manager of each SMM for continuous innovation in marketing and brand building through developing niche.

Annexure: State-wise number of existing regulated markets and recommended Smart Micro-Mandi (SMM)

Sl. No.	States/ Union Territories	Area in sq.km	Existing Regulated Markets	Area covered by each existing market (Col.3/5)	No. of districts with population density <100 persons per sq.km	Remaining area after excluding low density districts, in sq.km (col 3-area under col 6)	Number of SMM needed, each serving 100 sq.km
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Andhra Pradesh (AP+TS)	275069	905	303.94	0	275069	2751
2	Arunachal Pradesh	83743	131	639.26	All	0	0
3	Assam	78438	226	347.07	1	73550	736
4	Bihar	94163	0	0	0	94163	942
5	Jharkhand	79714	201	396.59	0	79714	797
6	Goa	3702	8	462.75	0	3702	37
7	Gujarat	196024	400	490.06	1	150350	1504
8	Haryana	44212	281	157.34	0	44212	442
9	Himachal Pradesh	55673	54	1030.98	4	23406	234
10	Jammu & Kashmir	222236	12	0	3	154178	1542
11	Karnataka	191791	512	374.59	0	191791	1918
12	Kerala	38863	0	0	0	38863	389
13	Madhya Pradesh	308144	536	574.9	1	300674	3007
14	Chhattisgarh	136034	184	739.32	3	114553	1146
15	Maharashtra	307713	881	349.28	1	293301	2933
16	Manipur	22327	0	0	4	5509	55
17	Meghalaya	22429	2	11214.5	2	15295	153
18	Mizoram	21081	0	0	7	3576	36
19	Nagaland	16579	18	921.06	5	8674	87
20	Odisha	155707	436	357.13	1	147686	1477
21	Punjab	50362	424	118.78	0	50362	504
22	Rajasthan	342240	443	772.55	3	245213	2452
23	Sikkim	7096	1	7096	1	2870	29
24	Tamil Nadu	130058	283	459.57	0	130058	1301
25	Tripura	10493	21	499.67	0	10493	105
26	Uttar Pradesh	240928	615	391.75	0	240928	2409
27	Uttarakhand	53484	58	922.14	3	30348	303
28	West Bengal	88752	457	194.21	0	88752	888
29	A & N Islands	8249	NIL	0	All	0	0
30	Chandigarh	114	1	114	0	114	1
31	D & N Haveli	491	0	0	0	491	5
32	Daman & Diu	112	0	0	0	112	1
33	Delhi	1483	15	98.87	0	1483	15
34	Lakshdeep	32	0	0	0	32	0
35	Puducherry	479	9	53.22	0	479	5
Total		3288015	7114	462.19		2820001	28200

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