

Agro-Economic Policy Briefs

Aiding the Future of India's Farmers and Agriculture



(Photo Source: <https://bit.ly/2S5hQqo>)

On Critical Policy Issues in India's Agricultural Economy

Issue 21, April 2021

Contents

1. Improving Water Use Efficiency in Uttar Pradesh: Micro-Irrigation under the Pradhan Mantri Krishi Sinchayee Yojna - Per Drop More Crop 2
2. Examining Relevance and Distribution Efficiency: Seed Minikits of Pulses in Bihar 6
3. Seasonal Time Trade-offs and Nutrition Outcomes for Women in Agriculture: Evidence from Rural India 11
4. Untapped Potential of Turmeric in Global Value Chains 13



For kind attention of:

The Hon'ble Prime Minister's Office,
the Ministry of Agriculture and Farmers' Welfare,
and all others interested

Compiled and Edited by
Centre for Management in
Agriculture (CMA)
Indian Institute of Management
Ahmedabad

Contact: Prof. Poornima Varma
Co-ordinator & Chairperson CMA,
or
Kashish
Academic Associate

Based on Research &
Contributions of 15 Agro-
Economic Research Centres
and Units, supported by
Ministry of Agriculture &
Farmers' Welfare

Improving Water Use Efficiency in Uttar Pradesh: Micro-Irrigation under the Pradhan Mantri Krishi Sinchayee Yojna - Per Drop More Crop

G. C. Tripathi

Introduction

- The ever increasing demand for water for irrigation purposes and the relatively lower efficiency of conventional irrigation methods emphasizes the need for special attention by policy makers and national planners towards initiation of advanced-cum-innovative high-tech irrigation infrastructure along with an efficient management and action plan. Raising water use efficiency in respect of crop irrigation and its related aspects like water-pumping, lifting, harvesting, shifting from water abundant to water scarce areas, etc., through the use of improved irrigation practices is the need of the hour. Among these is the practice of Micro-Irrigation (MI) technique, mainly consisting of drip/sprinkler irrigation device, which is based on pressurized water flow irrigation system.
- It is with the aforementioned motto under consideration, the present study on evaluation of Per Drop More Crop (PDMC) component of Pradhan Mantri Krishi Sinchayee Yojna (PMKSY) has been initiated by the national government and is being conducted in five states of India, including Uttar Pradesh. It studies the impact, benefits and challenges of the MI system which will be beneficial to the overall agriculture sector in general, and the entire farming community in particular.
- The Ministry of Agriculture and Farmers Welfare, Department of Agriculture, Cooperation and Farmers Welfare (DAC&FW) is implementing the PDMC component of the PMKSY which is operational in the country from 2015-16. The PDMC component focuses mainly on

improving water use efficiency at the farm level through precision/Micro-Irrigation (MI) (drip and sprinkler irrigation). MI techniques are also expected to bring a number of benefits in the form of (i) water use enhancement, (ii) increase in irrigated area with given quantity of water resources, (iii) enhanced productivity, (iv) labor cost savings, (v) electricity savings, and (vi) lesser pumping hours.

Findings

PDMC in Uttar Pradesh

- The action plan area of PDMC component of PMKSY in Uttar Pradesh (U.P.) consists of all of its 75 districts and the MI programs are equally applicable to horticulture, agriculture and sugarcane crops, while under other interventions of PDMC (MI) component, the priority areas by over exploited, critical, semi-critical and minor irrigation departments are developed tanks/water source clusters and Member of Parliament's adopted villages. In the state, Agriculture Department has been nominated as the nodal agency for PMKSY, while Department of Horticulture and Food Processing as the implementation agency for PDMC component of PMKSY.
- Progressive MI coverage up to 2019-20 in the state of U.P. has been of the order of 277282, area under MI is 56,953 hectares (ha) where 59.80 percent has been under horticulture crops, and 40.20 percent under agriculture crops, and the progressive MI as percentage of total irrigated area has been 1.93 percent. All MI adopters (96) in the study area started using

MI technique from 2018-19. Among total MI adopters, majority (59.38%) belonged to small (1-2 ha) size, followed by medium (2-10 ha) (34.37%) and marginal (<1 ha) (6.25%), with no landless/tenant or large (>10 ha) category farmers.

- Tube-well has been the main source of irrigation for 95.53 percent of MI adopters, while most farmers (96.88%) faced no scarcity of water, remaining 3.12 percent was subjective to

occasional scarcity or excess water situation. The breakup of irrigated area as micro versus non-micro has been 66.86 percent and 33.14 percent respectively. In respect of rainfall, 82.29 percent of total MI adopters were subject to average rainfall, while 17.71 percent had heavy rainfall. Figure 1 below shows the glimpses from the survey conducted for the implementation of PDMC scheme in Sonbhadra district of Uttar Pradesh.

Figure 1: Implementation of PDMC Scheme: Field Survey in Sonbhadra District of Uttar Pradesh



Source: Field Survey.

Impact of MI Adoption on Change in Area, Yield and Agronomic, Agro-economic Factors

- It is noteworthy that in case of all the three major MI adopting crops in the study area i.e., tomato, wheat and sugarcane, the extent of farmers reporting for change (higher increase/increase) has been relatively much higher in yield as compared to area. For (a) tomato, out of 14 reporting farmers, 78.47 percent recorded change in yield against that of only 57.14 percent in area, (b) in case of wheat, out of 84 reporting farmers, 76.19 percent recorded change in yield against that of only 40.14 percent in area, (c) out of 28 farmers growing sugarcane, all of them reported for change in yield on 100 percent basis, without even a single farmer reporting for change in area.
- It is emphatically found that the adoption of MI has benefitted the farmers substantially in enhancing (i) crop production, (ii) crop price, (iii) total sales revenue, and (iv) net profit/income. It helped reducing expenses on items like (i) seeds/plants, (ii) fertilizers, (iii) pesticides, (iv) diesel, (v) hours of pumping (irrigation), (vi) farm power and equipment, (vii) labor cost, and (viii) total cost.
- Out of total 96 MI adopters, 43 reported drip irrigation kit/set and 53 for sprinkler irrigation kit/set, where a farmer was allowed to avail only any one of these two. On average per farmer basis (a) Rs. 132384 has been the total cost for drip kit, out of which 14.84 percent was paid by the farmer, remaining being the subsidy, (b) Rs. 22531=00 as the cost of sprinkler kit, out

of which 70.25 percent was paid by farmer, remaining being the subsidy, (c) the total cost of pumps and tube-well (only if additional for MI) were Rs. 32933=00 and Rs. 9720=00 respectively and were totally paid by farmer. No maintenance cost has been paid by any of the MI adopter due to the privilege of three years Annual Maintenance Contract (AMC) by the contractor/supplier.

- Agronomically, besides resulting in higher yield/output, MI techniques also reduce water, fertilizer, pesticide, labor use, pest and weed problems as per 67 to 96 percent of total MI users on strongly agree/agree basis. Stated factors like (a) MI raises output quality/price, increases profitability, capital cost of MI is low, and (b) information on MI is easily available, easy to understand/operate, subsidy is easy to get these inferences are supported by 80.63 to 94.79 percent and 64.59 to 95.83 percent of total MI adopters respectively.
- The responsiveness of farmers in respect of various aggregate supply and distribution factors like large number of MI equipment supplying companies, good quality and reliability of MI equipment, large number of dealers arranging for subsidy/credit etc., has been found to be a bit low relatively and to the order of 60.41 to 88.12 percent. With respect to votes on perceived advantages and disadvantages of MI, it resulting to higher yields was voted as a strong advantage/advantage by all the 96 MI adopters, while other things like better output quality, high output price, less water need, etc. was supported by 67.71 to 95.83 percent of total MI adopters, except for easy marketing and youth employment which was supported by just 43.75 and 56.25 percent of total MI adopters respectively.

Impact and Related Benefits of MI Adoption

- Most of the groups/factors have significant extent of favorable reporting by the farmers towards a larger impact of MI. The order of top five groups/factors as per positive reporting (substantially positive/positive, taken together) by the farmers has been such: (i) village as a whole (98.96%), (ii) water conservation/availability (98.96%), (iii) environment (86.46%), (iv) upper caste (82.29%), (v) labor/poor (73.96%). The mean scores of all five groups/factors have been in the range of 3.81 to 4.23 i.e., above the no impact mean score of three.
- As per sample MI Adopters, the four items in order of preference are: (i) overall performance of MI is excellent/good (73.96%), (ii) performance of MI on improving water use efficiency is excellent/good (78.13%), (iii) performance of MI in reducing input cost is excellent/good/satisfactory (70.84%), (iv) performance of MI on increasing farm income/profits is excellent/good (65.63%). Mean scores of these four items are 4.13, 4.06, 3.83, 3.82 respectively which are all above the mean satisfactory score of three, to indicate utility and positive results of MI adoption. Among all MI adopters, 94.79 percent strongly agree/agree to continue the use of MI, while 87.50 percent strongly agree/agree to further expand the use of MI, irrigation techniques.

Problems Faced by MI Adopter/Non-Adopters

- The major problems faced by farmers, on the basis of votes on strongly agree/agree have been (i) lack of fencing and damage by animals (69.79%), (ii) poor marketing arrangement (25%), (iii) high cost of wells/tube-wells (20.83%), (iv) lack of knowledge/training for MI and land fragmentation (19.79%), and (v) lack of own wells/tube-wells and water table going down fast (18.75%).

- Among various suggestions by MI adopters, the top five voted items in respect of increasing the adoption and impact of MI are (a) more subsidy/government assistance (97.92%), (b) provision/support for farm fencing (94.79%), (c) better MI technology/equipment (92.70%), (d) better marketing arrangements (91.67%), (e) improved water availability (88.55%).
- The three main factors responsible for non-adoption of MI have been (i) high investment cost (66.67%), (ii) crop damage by animals (62.50%), (iii) lack of fencing (58.33%) as voted by 24 non-adopters of MI on strongly agree/agree and non-mutually exclusive basis. While majority of non-MI adopters do not support negativity towards MI adoption, the following factors other than the ones stated above report hindrances (i) unavailability of equipment, (ii) high operating cost, (iii) insufficient subsidy, (iv) unavailability of credit, (v) lack of information, (vi) fragmentation of land, (vii) unsuitability to farmers' land and crops as reported by 20 to 50 percent of total non-MI adopters on non-mutually exclusive basis.
- In case of non-MI adopters, it may be noted that (i) there is not even a single non-adopter farmer who is illiterate and without irrigation facility, (ii) majority of them (66.27%) have tube-well as the major source of irrigation, (iii) among kharif crops, paddy, maize, tomato, chilli have cent percent irrigated area except arhar, (iv) among rabi crops, wheat, fodder, mustard, gram and chilli are fully irrigated, (v) as a perennial crop, sugarcane, adopted by 46.83 percent of total non-MI adopters, is also cent percent irrigated.
- use of which can increase and even double farmers' incomes in a number of ways and thus, contribute towards state and national economy. As more than 85 percent of MI-adopters support (strongly agree/agree) to continue the use of MI and expand it further, it is erstwhile desirable and suggested that this technique must be continued along with its specified subsidies.
- In view of suggestions by 88.55 to 97.92 percent of MI adopters, the following points must be taken into consideration towards further extension and applicability of MI system in generation of more income from agriculture sector: (i) more subsidy (government assistance), (ii) support for farm fencing, (iii) better marketing arrangements, and (iv) improved water availability.
- The major problems faced by MI adopters must be looked into on a priority basis: (i) lack of fencing, (ii) damage by animals, (iii) poor marketing arrangements, (iv) high cost of wells/tube-wells, (v) lack of knowledge/training towards MI, (vi) lack of own well/tube-wells. These could be tackled through (i) providing fencing to safeguard crop damage by animals, (ii) improving marketing arrangements for MI produced crops, (iii) arranging more demonstration and field trials to improve knowledge levels of farmers about MI, (iv) providing 'boring' facilities to farmers, mainly small & marginal, who form the bulk of farming community, to have their own source of water availability.
- For 'Non-MI adopters group' the following findings have been observed from the study: (i) on overall sample basis, as well as in each category of farmers, the entire per farmer operated area is irrigated, (ii) tube-well is the main source of irrigation for 66.27 percent of non-MI adopters, (iii) 79.17 percent of all non-

Conclusion and Recommendations

- There is a wide scope for development of agriculture, horticulture and sugarcane crops in Uttar Pradesh subject to adoption of advanced irrigation techniques like Micro Irrigation, the

MI adopters have no scarcity of water. These all prompt a need for initiation among non-MI adopters to adopt MI technology in order to increase crop productions per farmer and avail other benefits.

- Furthermore, PDMC (MI) component of PMKSY also needs special emphasis in view of its enhanced utility towards reducing conveyance and application losses as compared to conventional flow irrigation practices and due consideration towards youth employment in enhancing MI's value added applicability.

References

- Department of Agriculture, Cooperation and Farmers Welfare (2019)- 'Pradhan Mantri Krishi Sinchai Yojna' Ministry of Agriculture and Farmers Welfare, Government of India.
- Department of Horticulture and Food Processing Uttar Pradesh (2019-20)-Year-wise Micro-Irrigation Growth, District-wise Progressive MI Coverage and Crop-wise Area under Micro-Irrigation: Under PMKSY-PDMC Scheme.
- Gandhi, Vasant P. (2014). Growth and Transformation of

Agri-business Sector: Drivers, Models and Challenges. Indian Journal of Agribusiness Economics, Vol.69, No. 1, Jan-March.

- Gandhi, Vasant P., Johnson, N. (2019). Research Proposal. Improving water use and its Efficiency in India's Agriculture: The impact of Pradhan Mantri Krishi Sinchayee Yojna (PMKSY)-Per Drop More Crop, Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad.
- MKSY-Per Drop More Crop (Micro-Irrigation) Implementation Guide Lines (2017): Department of Horticulture and Food Processing (Udyanevam Khadya Prasanskaran Vibhag) Uttar Pradesh. Implementation Guidelines for Conducting PDMC (Micro-Irrigation) Components of Pradhan Mantri Krishi Sinchai Yojna (2017).
- Sharma, S.B. (2019), Director, Horticulture and Food Processing, Uttar Pradesh, Lucknow; Letter No. 411/MI03-A/Evaluation/2019-20: Dated 23.11.2019 on subject Impact Evaluation Study of Per Drop More Crop-Micro-Irrigation under PMKSY 2018-19.
- State of Indian Agriculture (2017): Government of India, Ministry of Agriculture and Farmers Welfare, Dept. of Agriculture, Cooperation and Farmers Welfare. Directorate of Economics and Statistics: New Delhi. PP 113-117.

For further details, contact:

G. C. Tripathi

Agro-Economic Research Centre, University of Allahabad, Allahabad.

aercau_all@rediffmail.com; Phone: 9415310739

Examining Relevance and Distribution Efficiency: Seed Minikits of Pulses in Bihar

Rambalak Choudhary, Rajiv Kumar Sinha, Rosline K Marandi

Introduction

- Pulses play an important role, particularly in a country like India, mainly due to its rich protein content. They're called 'the poor man's meat'. India is the largest producer (25% of the world's production), consumer (27% of the world's consumption) and importer (14% of pulses in the world) (Srivastava, et.al 2010). Total pulses' production in our country during 2019-20 was estimated at 23.02 Million Tones (MTs), which was 2.76 MTs more than the last five years' average production of 20.76 MTs. It accounted for 23.51 percent of the area under food grains (127.56 million hectares) and contributed about 8.86 percent of the total food grains' production (285 MTs) in 2018-19.
- Pulses are grown in kharif (46.95%), rabi and summer (53.05%) seasons. As a result of stagnant pulse production and continuous increase in population, per capita availability of pulses has decreased considerably to 52.5 grams in 2017 from 60 grams in 1951. This proves that increase in population growth affects pulses availability in per capita terms. The nutritional value of various pulses may be seen in table 1 given below. Potential of pulses to help address future global security, nutrition and environmental sustainability has also been acknowledged by the United Nations declaring the year 2016 as 'International Year of Pulses.' This led to several important interventions in pulses' area and production across the world.

Table 1: Nutritional Value of Various Pulses (mg/100 gm)

Name of the Food Stuff	Gram	Urad	Moong	Kulthi	Lentil	Pea	Tur	Moth	Khesari	Cow Pea
Protein (%)	20	24	25	22	25	22	22	25	31	23
Vitamin A (IU)	316	64	83	119	450	31	220	16	200	60
Vitamin C	3	-	-	-	-	-	-	2	-	-
Vitamin K	0.29	0.19	-	-	0.25	-	-	-	-	-
Thiamine	0.30	0.41	0.72	0.42	0.45	0.47	0.45	0.45	0.39	0.50
Ribo-flavin	0.51	0.37	0.15	0.20	0.49	0.21	0.51	0.09	0.41	0.48
Nicotinic acid	2.1	2.0	2.4	1.50	1.50	3.50	2.60	1.5	2.20	1.30
Biotin (g/100gm)	10	7.5	-	-	13.20	-	7.60	-	7.50	202
Choline	194	206	-	-	299	-	183	-	-	-
Folic acid (g/100g)	125	144	-	-	107	-	83	-	100	-
Inositol	240	90	-	-	130	-	100	-	140	-
Pantothenic acid	1.3	3.5	-	-	1.60	-	1.50	-	2.60	-
Total Number of Vitamin/Mineral	12	11	5	6	11	5	10	6	9	6

Source: Pulses in India: Retrospect and Prospects (DPD/Pub. 1/Vol. 2/2016).

- As of now, India is the leading producer of pulses in the world and accounts for about 33 percent of the world's production, and about 39 percent of the area under cultivation (GoI, 2017). Though India is the largest pulses' producer in the world, it imports large quantity of pulses from rest of the world. In recent years, the quantity of imports came close to 50 lakh tones, whereas exports hovered around two to four lakh tons. India's imports and exports of major pulses during 2017-18 to 2018-19 may be perceived from table 2 given below.

Table 2: India's Import and Export of Major Pulses

(Unit: Lakh tons)

Pulses	Import				Export			
	2017-18	% Share in Total Pulses	2018-19	% Share in Total Pulses	2017-18	% Share in Total Pulses	2018-19	% Share in Total Pulses
Peas (Matar)	28.77	47.98	8.51	33.68	0.04	2.47	0.02	0.72
Chickpea (Chana)	9.81	16.34	1.85	7.35	1.27	70.92	2.28	80.02
Moong/Urad	3.46	8.69	5.74	22.71	0.16	69.33	0.18	6.56
Lentil (Masur)	7.96	12.55	3.48	9.84	0.11	6.24	0.13	4.88
Pigeon pea (Tur)	1.12	10.64	5.30	21.00	0.10	5.87	0.09	3.26
Total Imports/ Exports	56.07	-	25.27	-	1.79	-	2.85	-

Source: Department of Commerce, Government of India, Commodity Profile for Pulses, September 2019.

- Area under pulses and its production in India was 19.09 million hectares and 8.41 MTs respectively in 1950-51 which increased to 29.99 million hectares and 25.23 MTs in 2017-18, thereby showing increase of about 57 percent and 200 percent respectively. The yield rates also increased from 441 kg/ha in 1950-51 to 841 kg/ha in 2017-18 (an increase of about 91%). During 2018-19, the country produced 23.40 MTs of pulses, which was short of annual domestic demand to 26-27 MTs. During the year 2018-19 the Government targeted pulses' output of 26.30 MTs., however, country still faced huge shortage, but now the situation has improved a little bit (Economic Times 2020). Moreover, Indian Institute of Pulses Research (IIPR) has estimated total requirement of 25.39 MTs for the projected population of 1.55 billion (Gol, 2009).
- Country's 80 percent of the total area under pulse production was from six states, viz., Madhya Pradesh (24.94%), Rajasthan (17.77%), Maharashtra (14.51%), Karnataka (10.07%), Uttar Pradesh (7.56%) and Andhra Pradesh (4.69%), which produced nearly 80 percent of the total pulses production in 2017-18. Gram, Urad, Arhar (Tur), Moong and Lentil are the major pulses produced and consumed in India. Gram (chickpea) was the most prominent pulse with an average share of about 45 percent in total pulse production during 2017-18. The share of area under gram to total pulses was 35.21 percent followed by Urad (18.14%), Tur/Arhar (14.77%), Moong (14.21%), lentil (5.17%) and other pulses (12.50%) (Govt. of India, 2018). It may be seen in table 3.

Table 3: Area and Production of Major Pulses in India during 2017-18

Pulses	Area (Million Hectares)	% of Area	Production (MTs)	% of Production
Gram	10.56	35.21	11.23	44.51
Urad	5.44	18.14	3.56	14.10
Arhar/Tur	4.43	14.77	4.25	16.85
Moong	4.26	14.21	2.01	7.97
Lentil	1.55	5.17	1.61	6.36
Others	3.75	12.50	2.57	10.19
Total	29.99	100.00	25.23	100.00

Source: Compiled by the author from various publications/reports of Ministry of Agriculture & Farmers' Welfare, Government of India.

- Current scenario in India shows that domestic supply of pulses could meet rising demand from domestic consumers. This was due to the fact that different parts of the country had dietary preferences for specific type of pulses. An interesting behavior of consumption that has been observed is that there is very little substitution among different types of pulses (Joshi et.al, 2017). Besides, more than 83 percent area under pulses is rain-fed with limited input requirements, high degree of risks associated with production such as inadequate price incentives for the farmers to produce pulses (Verma, 2019). As a result, government intervention in pulses' production has assumed significance.
- Major pulse growing states occupied about 94 percent of the country's total pulse area in

Triennium Ending (TE) 2006-07, which slightly increased to about 96 percent during the TE 2016-17. The production in these major pulse growing states was about 98 percent of the national total during TE 2006-07 and 2016-17. Yield rates in eight major pulse growing states were higher than the average of all-India figure during TE 2006-07 and TE 2016-17. These 14 major pulse growing states may be termed as 'Pulse Road of India.'

Findings

- Due to increase in awareness about significant

nutritional benefits, there has been soaring demand for pulses in Bihar, especially among the vegetarians. In Bihar, pulses are also largely grown under rain-fed conditions and therefore, are prone to high fluctuations in yield. Yield rates of pulses varied largely across the districts of the state. During 2018-19, it varied from 492 kg/ha to 1374 kg/ha across the districts (GoB, 2020). Percentage share of the state's total pulses' area and production including its comparative scenario with all-India figures may be seen in the table 4.

Table 4: Percentage Share of Area and Production of Total Pulses in Bihar vis-à-vis India

(Area in lakh hectares & Production in lakh metric tons)

Year	India		Bihar		% Share of Bihar's Pulses to the Nation's	
	Area	Production	Area	Production	Area	Production
2000-01	203.5	110.8	7.17	6.21	3.53	5.60
2005-06	223.9	133.8	5.97	4.47	2.67	3.34
2010-11	262.8	182.4	6.05	5.56	2.30	3.05
2013-14	252.1	197.8	5.00	5.22	1.98	2.64
2014-15	231.0	171.6	5.06	4.29	2.19	2.50
2015-16	249.1	163.5	4.98	4.21	1.99	2.57
2016-17	294.4	231.3	4.97	4.65	1.69	2.01
2017-18	299.9	245.1	4.76	4.55	1.62	1.86
2018-19	290.3	234.0	4.79	4.53	1.65	1.94

Source: Compiled from various issues of Agricultural Statistics at a Glance, GoI & Economic Survey of Bihar, GoB.

- To streamline pulses' production in the state, the state government has undertaken various initiatives to reduce incidences of pest attack, increase yield and enhance price realization for the farmers (GoB, 2020). In order to find out the status of distribution efficiency of seed minikits of pulses in Bihar, a study was conducted based on both primary and secondary data collected from two districts, i.e., Patna and Muzaffarpur as these districts had highest seed minikits distribution during 2017-18/2018-19. A sample of 100 seed minikits of pulses beneficiary

farmers and 50 control group pulses growing farmers were selected from each of the selected districts (sample size:300) by using random sampling method.

- Bihar has 4.79 lakh ha of total pulses' area with production of 4.53 lakh tons during 2018-19, which were 1.62 and 1.85 percent of the country's total area and production of pulses respectively. Percentage share of total pulses' area to gross cultivable area was recorded at seven percent during TE 2006-07, which increased to 9.29 percent during TE 2016-17.

- The growth in area across the crops was either stagnant or had declined, except for the maize crop. After bifurcation of the state from Jharkhand in November 2000, the area and production of total pulses decreased by 4.7 percent and 29 percent respectively during TE 2000-01 to 2016-17. Area and production under total pulses in the state decreased by 18.93 percent and 4.36 percent respectively in TE 2016-17 as compared to TE 2006-07. State's total Lentil area and production increased to 4.17 percent and 15.45 percent respectively in TE 2016-17 over TE 2006-07. Except Lentil, Arhar and Gram showed negative growth in regard to area and production both during the same period.
- Yield rates of total pulses increased till 2013-14 and thereafter, it fell substantially. Across pulses, Moong's yield rate was found to have increased in recent years only. Other pulses' yield rates are still gloomy in the state. Around 83 percent of total respondents were dependent on agriculture and allied activities for their livelihood followed by mainly agricultural laborers (7%). Average annual income of the total respondents was recorded at about Rs. 42608 constituting 78.6 percent from agricultural and allied activities, and 21.4 percent from non-agricultural sources.
- Average productivity of the rain-fed crops for all respondents was calculated at 5.20 quintals/acre and for irrigated crops it was 10.4 quintals/acre. The value of output of main plus byproducts for total respondents was Rs. 16053 per acre. Major issue/problems perceived by the sample farmers were distribution of seed minikits to kith & kin (81%), limited availability (40.5%), delay in reimbursement of the charged amount (22.5%), procedural complexities (22%), OTP relating hindrances (19%).

Conclusion and Recommendations

- In order to achieve full benefits of seed minikit for pulses, awareness should be created among farmers regarding its core objectives for realizing maximum value of output by way of adopting 'optimal package of practices' for growth and use of recent High Yielding Varieties of pulse crops.
- The distribution of seed minikits could be based on mapping of respective crop fields and identification of respective crop growers having followed the mandated criteria, so that realization of the programme could be made with equity aspect.
- A help desk for online registration on department's portal at block/tehsil level should be instituted to help the poor or needy farmers.
- Reimbursement of seed minikit value to the respective beneficiaries should be made immediately after verification of the sowing plot, preferably during the mid-period of the respective crop. It is desired for better and timely application of inputs.
- Special efforts on the part of the government are needed for ensuring timely distribution of seed minikits, as expressed by sample farmers. To ensure multiplication of seeds, field visits of the Krishi Vigyan Kendra scientists are needed for extending technical advices to the beneficiary and other interested farmers along with capacity building of the field level staff.
- There is need to address concerns raised by the beneficiary farmers about inadequacy. Kith & Kin approach of distribution, OTP hindrance, untimely distribution, etc., should be avoided by proper monitoring of the concerned.

For further details, contact:

Rambalak Choudhary

Agro-Economic Research Centre for Bihar & Jharkhand, T. M. Bhagalpur University, Bihar

rbaerc@gmail.com; Phone: 7004586997

Seasonal Time Trade-offs and Nutrition Outcomes for Women in Agriculture: Evidence from Rural India¹

Vidya Vemireddy, Prabhu L. Pingali

Introduction

- Women play a significant role in agricultural and household activities. They are responsible for activities like cleaning, cooking, collecting water and fuel, etc., and also have to contribute to agricultural activities like transplanting, weeding and harvesting (FAO, 2011). With multiple tasks at disposal and competing demand from paid and unpaid work, women face time constraints and work burdens.
- It is observed that women engagement in income generating activities reduces their time involved in household food preparation, creating negative consequences on nutritional intake of family (Johnston et al., 2018). These nutritional outcomes may be further aggravated in peak agricultural seasons where women involvement increases in agriculture.
- There are no studies exploring the trade-offs between women's time and its effect on nutritional outcomes across various agri-seasons. This is the first study that associates seasonal time trade-offs with specific women's nutrition outcomes such as the consumption of calories, iron, etc.
- This study contributes to the literature on agricultural-nutrition pathways by examining the time-use pathways, estimates variation across cropping patterns and income groups, contributes to the knowledge of women's opportunity cost of time in an agricultural setting, measures multiple outcomes of women's actual consumption of nutrients, standardizes 502 locally consumed dishes in terms of nutrient

composition and time taken for preparation, provides precise nutrient intake estimates and time use information across seasons at the individual level, estimates of women and men's seasonal time allocation to agriculture and household activities.

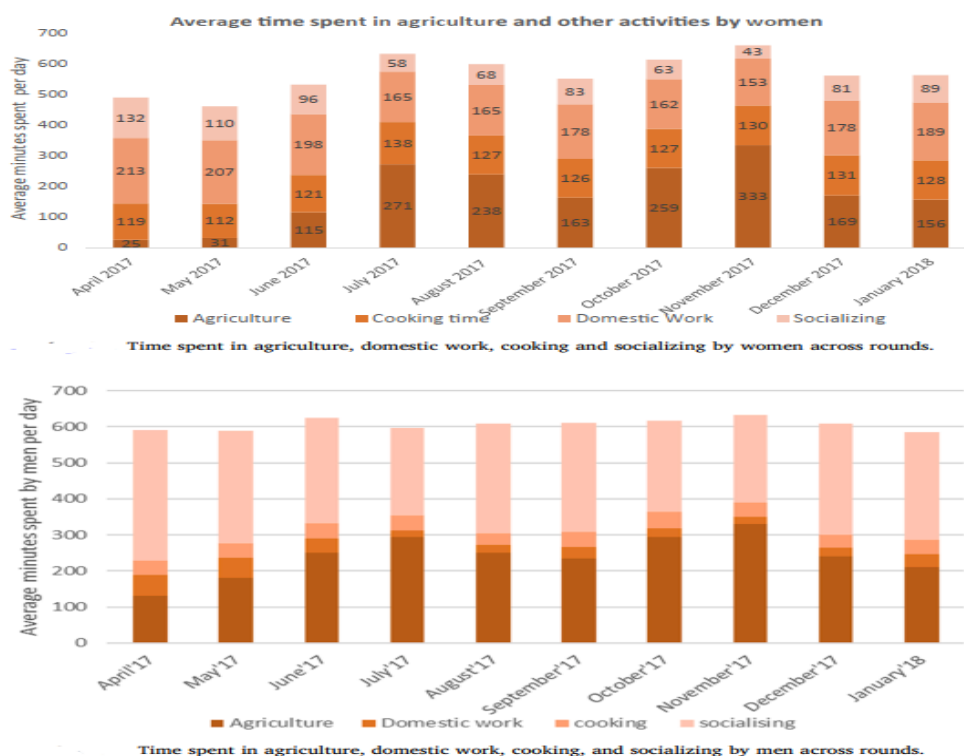
Findings

- There were three primary surveys conducted from December 2016 to February 2018 for the data in 24 randomly selected villages in Chandrapur district of Maharashtra, India. Ten-month time use data for both women and men across seasons for 960 households was collected. This included data points such as time use, diets, wages, and market-level prices, recipe standardization for deriving nutritional data (information on calories (kcal), macronutrients (proteins, fats, carbohydrates), micronutrients, and cooking time).
- Women contribute 333 minutes in the peak seasons of sowing (July-August) and harvesting (October–November) in performing agricultural activities and they perform household activities for 300 minutes on average (see Figure 1). Men's time in agriculture is almost equal to women but they spend about three times more in social activities, averaging 292 min across the seasons. On an average, men contribute about 33 and 39 minutes for domestic work and food preparation respectively. Women are time constraint and their wages reflect time trade-off between agriculture work and home-based activities, while men's wages reflect a pure income effect.

¹ Published in Food Policy.

<https://www.sciencedirect.com/science/article/pii/S0306919221000518>

Figure 1: Time Spent by Men and Women in a Day



Source: Field Survey.

- The individual-level fixed effects estimates show statistically significant negative association between the opportunity cost of time of women (as reflected in the women’s daily wages) and intake of calories, protein, fats, iron, zinc, and vitamin A. The opportunity cost of time for women increases during peak seasons when their demand is higher for agricultural activities and there is a trade off with unpaid household activities. Every ten additional minutes spent in agricultural work, cooking time is reduced by four minutes during the evening meal. This is due to the factors like exhaustion, lack of time affecting meal preparation by women as they choose to reduce cooking time, making dishes that are easy, less time consuming and requiring less effort. With these cooking choices, nutrition intake is affected negatively.
- With price fluctuation in staple food, women tend to substitute staples (cereals and rice) with non-staple, increasing their intake of protein, fat,

and vitamins. Paddy growing regions and mixed cropping regions show a negative relationship with nutrition intake by women, highlighting the impact of more labor intensive work and lower incomes in the case of paddy and mixed crops. This association is opposite (positive) in the case of cash crop growing households.

- Women having larger land holdings are less time constraint as compared to women with smaller land holdings. Women engagement is high in agriculture and the time pressure leads to less time for sleep, and rest-related activities, impacting women’s overall health.

Conclusion and Recommendations

- In view of the time-consuming household and agricultural activities, women’s time constraints can be alleviated by leveraging technologies. Labor saving technologies can be introduced in order to save up women time and allocate the saved time for cooking, leisure, rest, other income generating activities, etc.

- Women's participation in agriculture is crucial and demands more attention towards women to address their needs in agriculture. Agriculture interventions and development programs have to consider their impact over women's time and work burden so as to avoid any adverse effects on their nutrition.
- Women's wages are lower than men's and demand for policy/program strategies which aim to empower them with improved incomes, increased control over their earnings and strengthening their decision-making power is required.
- Reducing time burdens will not ensure increased nutrition among women, and hence, it will require different approaches:

reorientation of Indian public systems, shifting from staple centric food systems to nutrition-sensitive food systems, promotion of nutrient rich food through behavior change campaigns, enhancing market infrastructure for ensuring nutrient rich food across season.

References:

- FAO. (2011). The state of food and agriculture: Women in agriculture—Closing the gender gap for development.
- Johnston, D., Stevano, S., Malapit, H.J., Hull, E., Kadiyala, S. 2018. Review: Time Use as an Explanation for the Agri-Nutrition Disconnect: Evidence from Rural Areas in Low and Middle-Income Countries. *Food Policy* 76, 8–18. <https://doi.org/10.1016/j.foodpol.2017.12.011>.

For further details, contact:

Vidya Vemireddy

Centre for Management in Agriculture (CMA), IIM Ahmedabad
vidyav@iima.ac.in; Phone: 9999617132

Untapped Potential of Turmeric in Global Value Chains

Sangeeta Shroff

Introduction

- Turmeric is an important spice crop cultivated in India since times immemorial and the country is the world leader in production and consumption of the crop. The share of India in production of turmeric is 78 percent, followed by China which has a share of eight percent. Myanmar, Nigeria and Bangladesh have a share of three percent each. Thus, it is clear that by and large, India is the main producer of turmeric in the global economy.
- The total area under turmeric in the country in 2019-20 was 2.45 lakh hectares and the increase was more pronounced in the decades of 1990s when the area, which was 1.19 lakh hectares in 1990-91, increased to 166.21 lakh hectares in 1999-2000, thus registering a growth rate of 3.78 percent per annum during the period 1990-91 to 1999-2000. Over the period 1990-91 to 2019-20, the growth rate in area was 2.63 percent per annum.
- The state-wise data on area under turmeric reveals that Telengana had the highest area under turmeric with a share of 19.52 percent in 2019-20. Prior to 2014, Telengana was a part of Andhra Pradesh and together these two states had a share of 36.1 percent in 2013-14. Karnataka ranks second in area under turmeric with a share of 10.94 percent and the share of Tamil Nadu is 9.54 percent in 2019-20. Thus, turmeric cultivation is dominant in south India and the four states together have a share of 47.24 percent. Orissa has a share of 11.33 percent and is well known for organic turmeric that is cultivated by tribals. Though the state of Maharashtra has 6.24 percent area under turmeric, the district of Sangli in the state is a turmeric hub and a major trading center.
- Curcumin is the main biologically active phytochemical compound of turmeric. It is

one of the three curcuminoids of turmeric and is extracted, concentrated and standardized for usage in several products. Curcumin gives yellow color to turmeric and has a wide range of medicinal properties. It is a water soluble, orange-yellow colored powder. There are few players involved in manufacturing curcumin. Some of the major ones are—Akay Flavours & Aromatics Private Limited, Arjuna Natural Extracts Limited, Naturite Agro Products, Boimax Life, etc.

- The usage of curcumin in various products is increasingly gaining importance, but this product is mainly exported. It is roughly estimated that 1.5 percent of production of dry turmeric is utilized for production of curcumin. Other value added products of turmeric which have export potential are turmeric powder, oil and oleoresin.

Findings

- Out of total exports of turmeric, the share of dry turmeric was highest in quantity and value terms. In quantity terms, the share ranged between 44.38 percent in 2016-17 to 59.84 percent in 2019-20, while in value terms, the share ranged from 24.67 percent in 2018-19 to 31.51 percent in 2019-20.
- The next important export item was turmeric powder and the share in quantity ranged from 30.27 percent in 2019-20 to 37.47 percent in 2015-16. However, the exports of low volume, high value items such as turmeric oil and turmeric oleoresin was not very encouraging. The quantity of turmeric oil exported showed a decline over the period 2015-16 to 2019-20. In case of turmeric oleoresin, the per unit price declined from Rs. 3374 per kg in 2015-16 to Rs. 2679 per kg in 2019-20.
- Turmeric oil and oleoresin are more hygienic, convenient to use, and there are lesser chances

of contamination. Hence, there is a considerable scope to increase export of these items to developed countries such as USA, Canada and other European countries.

- It is well known that India is a major producer, consumer and exporter of turmeric. However, despite being a leader and far ahead of other countries, India still imports turmeric from other countries. Discussion with traders who mainly sell to processors and extraction units revealed that the price in the domestic market is higher than that in the international market and hence, processors find it more economical to import. There is also high volatility in prices, both in terms of intra-seasonal and inter-seasonal in domestic markets and processors face several risks due to price fluctuations.
- There are few varieties of turmeric such as Alleppey and Lakadong which have high curcumin content and demand from extraction units is mainly for the varieties which have high curcumin content.

Conclusion and Recommendations

- While India ranks first in the production of turmeric in the world, the country is lagging behind in productivity, and there is tremendous scope to increase the same. This is possible by using quality, disease free planting material and better input management which can greatly increase the yield. Turmeric crop is impacted by abiotic and biotic stress which leads to crop loss. The crops cannot withstand waterlogging and hence, soils with good drainage are required.
- A number of diseases such as soft rot, bacterial wilt, stem borer, leaf spot etc., often destroys the crop. Certain diseases such as bacterial wilt are not easily eradicated and if the farmers use saved seeds which have been impacted by diseases then the productivity is likely to

be reduced. There is a need to use certified seeds which are free from diseases and of quality planting material to enhance yield. Seed replacement with improved varieties is a priority in order to enhance productivity. Integrated pest management also plays an important role for quality produce and higher yield which will reduce the cost of production, increase the yield and make the product more competitive in international markets.

- Turmeric is a nutrient exhausting crop and if grown continuously on the same soil, the productivity is likely to get reduced. It is therefore, important to shift the cultivation of the crop and also apply suitable nutrients in order to enhance productivity. Intercropping with leguminous crops, crop rotation and organic manure are some of the practices which must be followed to maintain the fertility of the soil. Scientific storage of the crop is also important.
- Organic turmeric is produced largely in Sikkim and Erode in Tamil Nadu. The market infrastructure in Sikkim as well as in the big wholesale markets such as Siliguri, where it is transported, is not suitably designed to handle organic turmeric. Hence, conventional and organic produce often gets mixed which lowers the price received by farmers. In Erode, farmers indicated that they were reluctant to produce organic turmeric because the cost of cultivation was higher and they had to further incur certification fees. Subsidy could be given to farmers for certifying their produce to benefit from higher prices in domestic as well as international markets.
- Turmeric suffers from intra-seasonal and inter-seasonal fluctuations in prices, although there is a futures market which can reveal the assessment of demand and supply. Hence, price in the

futures market must serve as a guiding factor to make decision on area allocated to the crop. This will enable the farmer to withstand price fluctuation and the demand and supply can also match. However, most farmers are small and marginal and cannot directly participate in futures market because of minimum trading quantity thresholds and also maintaining daily mark to margins is difficult. The farmers also have limited knowledge about market operations on futures trading. Hence, farmers can benefit from futures trading only if producer organizations are formed which can participate in the market on behalf of farmers. The farmers must also be trained on the benefits of futures markets as the prices in these markets will be more useful in deciding their cropping pattern, as compared to resorting to the previous year's price as a guiding force which leads to gluts and shortages of the produce and consequent impact on prices. These fluctuations in price create an incentive for processors to import the produce.

- In order to promote exports of turmeric to countries such as USA and West Europe, it is necessary to improve the production of varieties which have high curcumin content. In India, Lakadong variety in North East, and a few other varieties in the south are known to have high curcumin content and hence, all post-harvest management with respect to these varieties must be increased. If varieties of turmeric with large curcumin content are cultivated, it will bring considerable gains to the turmeric economy of the country.
- While India produces about three-fourth of the world production of turmeric, the country still imports the product. The product was traditionally imported from Ethiopia and Myanmar but in recent years, Vietnam has become a major exporter to India. Hence, it

is important that the country produces high yielding varieties of turmeric with high curcumin content in order to restrict imports and instead become a major exporter not only of turmeric but also of its value added products. India must largely capitalize on its low-volume high-value products such as turmeric oil and oleoresins which have high demand in international markets. This will boost the turmeric economy and enhance the foreign exchange earnings of the country.

Acknowledgement

The policy brief is extracted from a project "Assessment of Ratio of Different Products/Forms of Spices Being Marketed: Study Based on Ginger and Turmeric" sponsored by Ministry of Agriculture and Farmers' Welfare, Government of India, December 2020, coordinated by Sangeeta Shroff.

For further details, contact:

Sangeeta Shroff

Agro-Economic Research Centre, Gokhale Institute of Politics and Economics, Pune.

sangeeta@gipe.ac.in; Phone: 9923063688



CENTRE FOR MANAGEMENT IN AGRICULTURE (CMA)

Indian Institute of Management Ahmedabad (IIMA)

Vastrapur, Ahmedabad, Gujarat 380015

e-mail: cma@iima.ac.in | **Phone:** +91-79-7152-4650, 7152-4651, 7152-4652

Web: www.iima.ac.in