

Doubling farmers' income by 2022: pathway and strategies for wheat producers

G. P. Singh¹, Sendhil R.², Anuj Kumar³, Satyavir Singh⁴ and S. C. Tripathi⁵

Indian Institute of Wheat and Barley Research, Karnal (Haryana) 132 001

Agriculture development in India has been viewed by and large in the context of increasing the output rather than welfare of the farmers. In the recent past, the sector has been facing regular distress and crisis posing a severe threat to peasants in practising agriculture as a main source of livelihood. Under this perspective, the Government of India in 2016 announced to double the farmers income (DFI) by 2022 by shifting the focus from agricultural output and food security to income security. Farm household income comprise revenue from sources viz., wage, crop production, livestock rearing and non-farm activities (non-farm income includes earnings from non-agricultural economic activities like manufacturing, handicrafts, repairs, construction, mining and quarrying, transport, trade, communication, community and personal services in the rural areas etc). The intention of the Government of India is to double the income including farm and non-farm activities in a span of six years since the announcement requires a compound annual growth rate of 12.25% from the base year 2016. Given the sources of income, the article discusses the pathway and strategies for doubling the income of wheat producers by 2022, a major food security crop accounting for about 35% of total foodgrains produced and being cultivated in 30.6 million ha by around 25 million farmers.

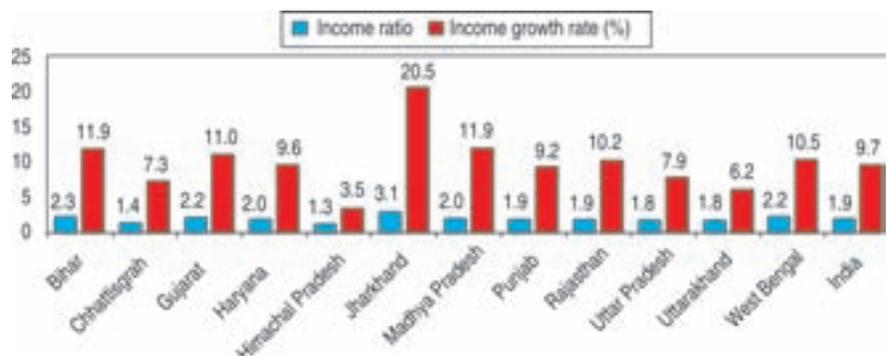
Key words: Farmers, Income, Pathway, Producers, Strategies, Wheat

THE ratio of gross income in nominal terms from wheat production between 2006-07 and 2013-14 by taking into account of main-product (grain) and by-product (straw) indicated that the income has doubled in a majority of the states such as Bihar, Gujarat, Jharkhand, Madhya Pradesh and West Bengal (Fig. 1) in the past. However, it has not doubled for those states owing to price inflation over the years. Increasing support prices year after year also plays a major role in income escalation. Further, in all the income doubled states, the productivity levels were low during the base period and have been increasing at a higher growth rate in comparison to the higher productivity states like Punjab and Haryana wherein the rate of growth in yield levels is relatively low. For instance, between 2006-07 and 2013-14, Jharkhand, a low

productivity state registered the highest growth in income (88% increase in yield) @ 20.5% per annum with income tripling; whereas, in Punjab, a high productivity state, the income has grown at 9.2% (only 19% increase in yield) but not doubled. The analysis indicates that in high productivity

states, reduction of costs followed by increasing the yield and in low productivity states, increasing the yield followed by cost reduction should be the focus for enhancing the income of wheat producers.

The potential pathway for double the farmers income (DFI) by 2022 has to arise from productivity of the



Data: Directorate of Economics and Statistics, Government of India.

Fig. 1. Income ratio and compound annual growth rate for wheat producers (2006-07 to 2013-14).

crop, cost reduction technologies, diversification in farm and non-farm activities, pricing mechanism of both inputs and outputs, adoption of risk management tools, level of wage rate and salaries for farm labour as well as different sources of non-farm activities. Keeping this at the forefront, the pathway has been formulated integrating science and technology, extension, institutions and policies to double the farmers' income. Under science and technology, innovations and interventions like improved high yielding wheat varieties and conservation agriculture practices will help to realize enhanced income through yield increase as well as cost reduction which warrants for intensive extension approach to all section of farmers. However, the translation of yield into monetary value requires proper price realization at markets and the realized price for the produce should be stable over years which needs the intervention of institutions and policy support from the government. The following section presents the technological interventions and innovations to be taken at farmers' field in the context of doubling the income from wheat production alone.

Strategies for enhancing income: technological interventions and innovations

Improved wheat varieties: An improved wheat variety, as a technology – an outcome of science, always helps the farmers to produce more in a given piece of land. The superior wheat varieties developed and released for cultivation over a period of time have been exhibiting an increased trend in their potential yield levels since inception of the coordinated research project. Adoption of the newly released wheat varieties at farmers field (region specific) has resulted in additional profit of ₹ 13,420/ha in comparison to check varieties (farmer practice) after deducting the operational costs. A bunch of region specific improved wheat varieties were demonstrated at farmers' field in 2016-17 and the results showed a significant yield gain over the farmers practice. The state-

Table 1. Yield gain and additional profit from adoption of improved wheat varieties (2016-17)

States	Improved varieties (kg/ha)	Check varieties (kg/ha)	Yield gain (%)	Additional profit (₹/ha)	Additional profit (%)
Asom	2,522	2,001	26.04	8572	32.59
Bihar	4,142	3,384	22.4	15176	43.05
Chhattisgarh	2,761	2,384	15.81	7260	22.11
Gujarat	4,787	4,458	7.38	7178	11.07
Haryana	5,412	5,150	5.09	2153	3.08
Himachal Pradesh	3,084	2,650	16.38	7944	28.96
Jammu & Kashmir	3,345	2,864	16.79	10785	29.62
Jharkhand	3,492	2,747	27.12	12319	66.91
Karnataka	3,504	3,004	16.64	7168	20.54
Madhya Pradesh	4,779	3,981	20.05	16764	39.14
Maharashtra	4,069	3,335	22.01	21329	46.15
Nagaland	1,040	895	16.2	3583	42.61
New Delhi	4,729	4,390	7.72	5827	12.51
Punjab	5,484	5,251	4.44	6658	7.15
Rajasthan	5,019	4,390	14.33	11896	22.1
Uttar Pradesh	5,098	4,481	13.77	10154	15.83
Uttarakhand	3,270	2,530	29.25	14717	45.39
West Bengal	3,886	2,904	33.82	19747	108.16

wise yield gain (Table 1) due to improved varieties indicated that the maximum yield gain was observed in West Bengal (33.82%), followed by Uttarakhand (29.25%), Jharkhand (27.12%), Asom (26.04%), Bihar (22.40%), Maharashtra (22.01%), Madhya Pradesh (20.05%), Jammu and Kashmir (16.79%), Karnataka (16.64%), Himachal Pradesh (16.38%), Nagaland (16.20%), Chhattisgarh (15.81%), Uttar Pradesh (13.77%), Delhi (07.72%), Gujarat (07.38%), Haryana (05.09%) and Punjab (04.44%). It is evident that the yield gain was more in low productive states and less in high productive states. Table 1 shows the monetary benefit of yield gain due to the demonstrated improved wheat varieties at farmers' field. The additional profit was highest in Maharashtra (₹ 21,329/ha) followed by West Bengal (₹ 19,747/ha), Madhya Pradesh (₹ 16,764/ha) and Bihar (₹ 15,176/ha). In percentage terms the additional profit was more in West Bengal (108.16%), followed by Jharkhand (66.91%), Maharashtra (46.15%) and Uttarakhand (45.39%). It is explicitly clear that adoption of recent and improved varieties will enhance the income of farmers.

Wheat production technologies: The income can be increased through output escalation by consolidating the validated scientific techniques/

technologies along with improved varieties. Table 2 presents the level of additional profit attained at farmers' field in 2016-17 by adoption of different technologies including wheat varieties. Cultivation of *durum* has resulted in additional profit to the tune of ₹ 26,643/ha (+56.05%) owing to the grain demand for exports as well as diverse products manufacture. However, the *durum* wheat has been under cultivation only in certain pockets of India, especially at Central Zone and Peninsular Zone. Barring the establishment cost in micro-irrigation system which takes years to offset the investment, the drip irrigation helps to improve the water use efficiency and results in additional profit of ₹ 5,800/ha (+9.75%). Similarly, other technologies results additional profit in various magnitudes which can be chosen by the farmer based on the availability and suitability to their region.

Conservation agriculture practices or cost reducing technologies: Apart from the varietal improvement and technologies, income can be increased by adoption of conservation agriculture practices which facilitate to reduce the operational costs at various magnitudes. For instance, zero tillage, a conservation agriculture (CA) practice reduces the operational costs by ₹ 2,137/ha apart from yield



Table 2. Technology wise additional profit by adoption at farmers field (2016-17)

Technology	Additional profit in ₹/ha	Additional profit in %
Bio-fertilizer	6046	10.87
Drip irrigation	5800	9.75
Durum	26643	56.05
Hydrogel	3788	5.69
Improved variety	13420	30.93
Improved variety (late sown)	8423	16.24
Improved variety (restricted irrigation)	9914	27.63
Improved variety (salt tolerant)	3440	5.65

enhancement and restricting resource damage at farmers' field. The additional profit realized at farmers field through adoption of zero tillage has been estimated at ₹ 4,451/ha (+10.61%), (Table 3). Similarly, rotavator and happy seeder practices results in additional profit to the tune of ₹ 6,138/ha (+8.67%) and ₹ 7,500/ha (+9.11%), respectively. However, the availability and cost of machine is a concern and if purchased it needs some years to offset the investment. For small-and marginal-land holders, the use of CA machines can be materialized on custom hiring basis which still will place them under profitable zone. Even, micro-irrigation system like drip and

Table 3. Technology-wise additional profit by adoption at farmers' field (2016-17)

Technology	Additional profit in (₹/ha)	Additional profit (%)
Happy seeder	7,500	9.11
Rotavator	6,138	8.67
Zero tillage	4,451	10.61

sprinkler enhances the water use efficiency (16-33%) by forgoing one irrigation equivalent of water as consumed under conventional irrigation. Enhanced use efficiency of water results in higher productivity as well cost reduction resulting in increased income at the rate of ₹ 5,800/ha (+9.75).

Diversification / Intensification / Relay cropping for higher profitability: Diversification is one of the most reliable and suggested interventions for all holding size groups being a popular risk management strategy. It is explicit from Table 4 that diversification / intensification / relay cropping results in higher profit in comparison to the conventional rice-wheat system which is predominant in the Indo-Gangetic plains of India. In the case of marginal-and small-land holders, bed planting of wheat along with vegetables like cucurbits as relay cropping in alternate furrows will yield higher profits in comparison to sole wheat cultivation.

Apart from the above interventions, farmers should insure

the wheat crop to avoid any unforeseen losses and follow the below scientific package of practices for enhancing the income by ₹ 11,255/ha as evident through demonstrations conducted across India in 2016-17. Farmers' income can be doubled by using the followings:

- Seed replacement and varietal replacement of improved wheat varieties.
- Soil-test based fertilizer application.
- Use of more bio-fertilizers, vermi-compost and farmyard manure in addition to chemical fertilizers.
- Supplementing soil with micro-nutrients like Mn, S, Zn and Fe (if deficient).
- Sowing the seeds after treatment for better germination and healthy seedlings.
- Opting normal sowing (date of sowing) to take advantage of the weather anomalies.
- Adopting the recommended package of practices (region specific).
- Capacity building and skilling on special practices to improve economic efficiency.

SUMMARY

The ambition of the Government of India has to be met coherently through productivity enhancement coupled with cost reduction, price realization and policy support. Income from a single crop or commodity will not fulfil the target of doubling farmers' income but it has to emulate from farm and non-farm sources. Diversification of activities which yields better remuneration (region specific) should be the ideal strategy. Clearly, in the case of wheat, the whole value chain has to be strengthened to be on the track of doubling the income for all classes of farmers.

Table 4. Level of profit realised under diversification/intensification/relay cropping

Cropping system (Wheat based)	Profit (₹/ha)	Intended region/ Class of farmers
Rice (TP) – Wheat (CT)	24,400	Punjab, Haryana,
Rice (TP) –Wheat (ZT) – greengram (ZT)	46,923	Uttar Pradesh, Bihar
Rice (TP) –Wheat (bed) – greengram (bed)	49,351	
Rice (TP) – Wheat (bed) – cowpea (bed)	39,256	
Maize – vegetable pea – wheat	33,400	
Pigeon pea (bed) – wheat (bed)	32,800	Uttar Pradesh, Bihar
Wheat (bed) + bottlegourd (Relay cropping in alternate furrows)	132,547	Small-and marginal-farmers
Wheat (bed) + cucumber (Relay cropping in alternate furrows)	76,977	
Wheat (bed) + bittergourd (Relay cropping in alternate furrows)	64,601	
Wheat (bed) + ridgegourd (Relay cropping in alternate furrows)	70,506	

TP, Transplanted; ZT, Zero tillage; CT, Conventional tillage, and Bed, Bed planting

¹Director, ² Scientist and ³⁻⁵Principal Scientist Corresponding authors e mail: r.snedhil@gmail.com

