

RESEARCH ARTICLE

Analysis of agriculture and dairy related driving forces for future farming in Haryana

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Received: 07 July 2023 / Accepted: 23 June 2024 / Published online: 23 August 2025

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Abstract: Declining size of landholdings without any alternative income augmenting opportunity can lead to dramatic drop in farm income and cause agrarian distress. The reduction of poverty and sustainability of economic growth in India are directly correlated with crop and associated farm operations. Growing concern for food and nutritional security is giving an impetus to integrate the cropping fields with alternate income generating activities. Haryana is known as 'bread basket' of India. The state has diverse agro-ecology and cropping pattern. Delphi technique was used to find out the future scenario of farming sector in Haryana state. A total of 60 respondents were selected for Delphi survey. The driving forces were judged independently by each expert on Likert type scale. An index was developed to identify key driving forces, which was obtained by taking average of index value of importance of the driving forces and probability of driving forces. The study indicates that, in the near future, there will be increased efforts to reduce the use of pesticides and insecticides in agriculture. In the dairy sector, there will be greater scope for mechanization in the upcoming days. The study concludes that changes in consumption pattern, increasing market orientation, rising urbanization and profit orientation were acting

as main driving forces for future changes in the farming sector of Haryana.

Introduction

The current pace of progress of Indian agriculture needs to be amplified to meet the demand of growing population. Total food grain production in the country is 308.65 million tonnes in 2020-21 (Economic Survey 2021-22). Food grain production of 333 MT is projected to meet the requirements of 1.65 billion populations in 2050 (Economic times, 2015). Declining size of landholdings without any alternative income augmenting opportunity can lead to dramatic drop in farm income and cause agrarian distress. Growing concern for food and nutritional security has given an impetus to integrate the cropping fields with alternate income generating activities. The reduction of poverty and sustainability of economic growth in India are directly correlated with crop and associated farm operations. Hence, it is appropriate to integrate allied enterprises into cropping systems to ensure the long term land productivity. The importance of integration of other enterprises is essential for Indian agricultural system to promote efficient use of available resources and convert them into a possible means of profitability by changing the focus of research from cropping systems towards farming systems.

Haryana is known as the bread basket of India. The state has diverse agro-ecology and cropping pattern. During 2020-21, Haryana has the share of 5.92 per cent of total food grain production of the country. The share of agriculture and allied sector in total GSVA of Haryana state at current prices is 20.92 per cent in 2020-21 (Agricultural Statistics at a Glance, MoA&FW, GoI, 2021). In a study conducted in Haryana, which is part of green revolution belt, soil was found to have waterlogging, salinity, soil erosion, decline and rise of groundwater table linked to brackish-water and alkalinity, affecting production and food security in the future (Singh, 2000). Farm diversification is required for Haryana's agriculture-based economy to improve the income level of small and marginal farmers. Analysis of driving forces of future farming will facilitate to frame efficient farming strategies for achieving agriculture sustainability.

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Methodology

Delphi technique was used to find out the future scenario of farming sector in Haryana state. Driving forces were identified based on the review of literature and expert opinion of agricultural scientist and extension specialists. The driving forces were structured based on different sectors of agriculture i.e., crops, livestock, horticulture, fisheries and forestry. Some of the trends were identified and desirable quantification of probable changes was done based on consensus of experts.

The expert panel was assumed to have expertise in agriculture and representation from study region. A total of 60 respondents were selected for Delphi survey (Table 1).

Delphi questionnaire was developed based on driving forces and direction of future changes to measure importance of driving forces and probability of occurrence of change. The driving forces were judged independently by each expert on Likert type scale (Table 2).

The first round online (using google form) and offline survey (as per convenience) consisting of 41 statements and driving forces regarding future agriculture sector was circulated to all participating expert panel members. The names of the experts were kept confidential to avoid influence of other experts on the response of an expert.

Round I: In the first round, questionnaire was sent to all the selected experts i.e., 60 experts. All experts responded for the first round.

Round II: The results of the first round were again sent back to the experts for getting consensus. In the second round, only 15 experts responded. Responses of experts were analyzed by measures of central tendency (Arithmetic mean and median) and dispersion (Standard deviation, quartile deviation) (Grisham, 2008). The analysis of the first round was sent back to experts including measures of central tendency in order to investigate whether consensus increases or uncertainty remains. After completion of second round, an index for the statements to identify key driving forces was obtained for importance of the driving forces and probability of driving forces, separately, using following formulae:

$$\text{Index value} = \frac{\text{Actual obtained score}}{\text{Maximum obtainable score}} \times 100$$

Final index value was estimated by taking average of index value of importance and probability of occurrence.

Results and Discussion

As described in Table 3, diversification as a concept is getting larger attention mainly because of the exploitation of ground

water in terms of mono cropping of rice- wheat pattern. Concerted efforts are required to recharge the over exploited ground water regions (0.727) in terms of water harvesting structures that in turn will help to manage this issue in the upcoming years. Due to population *growth*, urbanization, and climate change, competition for *water* resources is expected to *escalate*, and *increased* water scarcity and drought due to climate change are also expected. Because of the water scarcity rice wheat cropping system will gradually be replaced in the coming years (0.673).

In the near future, there will be increased efforts to reduce the use of pesticides and insecticides in agriculture (0.670). The overuse of chemical fertilisers degrades organic soil. Newer strategies need to be formulated to minimize their usage or to improve their effectiveness. For example, genetically modified plants are preferred because they are more resistant to certain pests or pathogens that would otherwise necessitate pesticides, which could lead to a reduction in extra pesticide consumption. The climate smart village concept entails incorporating climate-smart agriculture into village development plans through the use of local knowledge and experience, which is further supported by local institutions and it will be the major attraction of the future (Jat, 2014). Hence more number of villages can be converted into climate smart in the upcoming years.

As a big boost to the crop diversification scheme, farmers have started opting to pulses and oilseeds from traditional paddy and millet crops. When compared to the year 2020, the area under pulses (green gram and pigeon pea) expanded by 74 per cent during the 2021 Kharif season, with production increase of 67 per cent. Similarly, the area under oilseeds increased by 42 per cent between 2020 and 2021, resulting in 48 per cent rise in production (Sharma, 2021). The proximity to Delhi, where there is a considerable demand for fruits, vegetables, and flowers, gives Haryana's farmers an advantage over other states in expanding horticulture crop-dedicated areas while simultaneously catering to the local market. Farmers are increasingly realising the benefits of growing vegetables, flowers, medicinal and aromatic plants and fruits. Protected farming is a new technology for growing vegetables, flowers, and other high-value and perishable commodities.

Fig 1 indicated that livestock population (in thousands) shows a declining trend from 2003 (8885) to 2019 (7112.34). The fall in buffalo population has had an impact on the overall trend of livestock population in Haryana. Facilities for good germ plasm, management of unproductive animals, and feed and fodder assurance can help to maintain the adequate balance of the state's livestock population. In the dairy sector, there will be greater scope for mechanization in the upcoming days (0.647). The farms will be equipped with latest technologies in feeding, milking, housing management. Value added dairy products will get higher demand. The rural women were also encouraged for forming the Self-Help Groups for initiating ventures (0.607) based on value

added products from dairy. Integrated farming system is a combined approach aimed at efficient sustainable resource management for increased productivity in the cropping system along with mixed farming system including poultry and small ruminants such as goat and pig. Chances of adoption of integrated farming system approach will increase in the coming years.

In the food and agri processing industries, there will be more opportunities in the coming years for the development and deployment of appropriate post-harvest machinery particularly for pulse milling, oil extraction and jaggery recovery. While huge

traditional companies attempt to lower operational costs and manage economies of scale more efficiently, India's agritech ecosystem (0.640) has attracted a wave of startups offering technology-based solutions such as provision of market places, storage and transportation services and agronomy consultancy services. Given the expanding number of online consumers, appropriate IT infrastructure has become a requirement for Indian enterprises. Market linkages provide scope via developing packaging, branding, and exposing farm output directly to the consumer market or commercial institutions.

Table 1 Respondents of Delphi survey

Department	Level	Number
Dept. of Agriculture	SDAOs, ADOs	10
Dept. of Animal husbandry	SDO (AH), Poultry Development Officers	10
Dept. of Fisheries and Dept. of Horticulture (five each)	District Fisheries Officers District Horticulture Officers	10
State University (Agriculture, Horticulture and Veterinary)	Faculty members	10
KVK	SMS	10
ICAR	Scientist	10
Total		60

Table 2: Measurement of importance and probability of driving force

Importance of driving forces	Probability of occurrence of change	Score
Extremely important	Highly uncertain	5
Very important	Uncertain	4
Important	May be	3
Less important	Reasonably certain	2
Not important	Highly certain	1

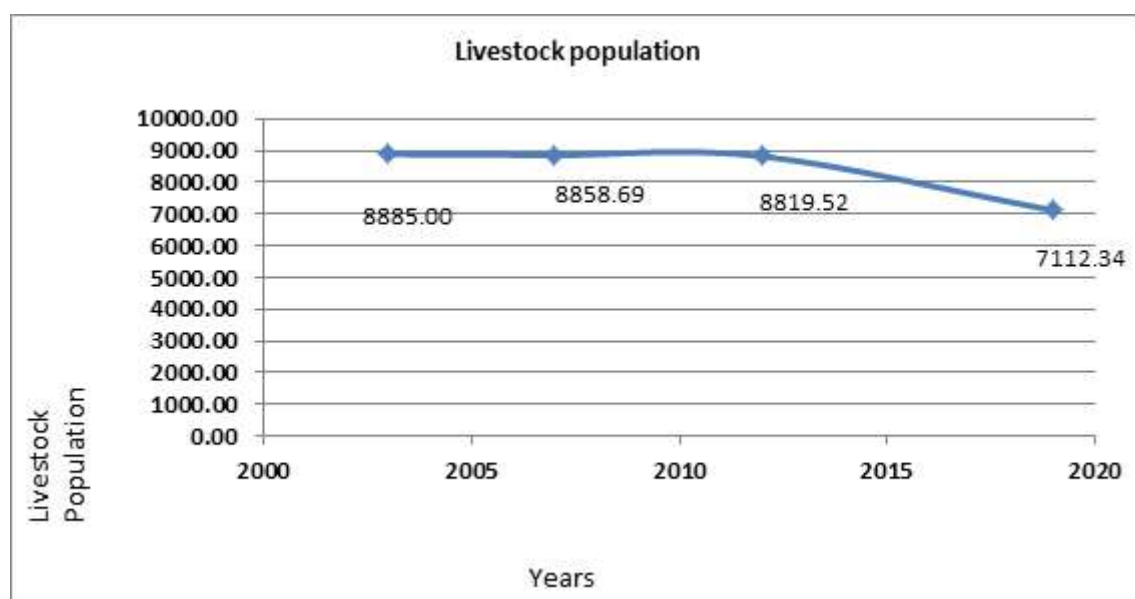


Fig. 1 Changes in livestock population in Haryana from 2002 to 2020

The state is attracting several allied enterprises (0.607). The bee-keeping subsidy will be available for activities such as the development of honey bee nucleus stock, bee breeding, and the distribution of honey bee colonies, hives, and bee-keeping equipment. The Haryana state government has established the 'Har Ghar Haryali' scheme to increase afforestation (greenery in every household). The scope of shrimp cultivation in saline water provides a significant boost to the fisheries sector in Haryana.

Table 3 indicates that changes in consumption pattern, increasing market orientation, rising urbanization and profit orientation were acting as main driving forces for future changes in the farming

sector of Haryana. Sustained economic expansion, rising per capita income, and more urbanisation are driving a change in consumption patterns toward high-value food commodities such as fruits and vegetables.. Horticulture crops cover 4.17 lakh hectare area, which is 6.35 per cent of the gross cropped area of Haryana state. Total area under fruit cultivation was 71,460 hectare in the year 2020-21 with production of 12.31 lakh MT (2020-21). Per capita availability of milk and egg is 1005 g/day (2019-20) and 179 eggs per capita per annum (2017-18) respectively (Economic Survey of Haryana, 2021).

Table 3: Important driving forces of future changes and their index values in Haryana

S. No	Statements	Driving force	Index value
	Agriculture, Horticulture, Forestry Fisheries and other allied enterprises related driving forces		
1.	Intensive efforts are required to recharge over exploited ground water	Degradation of natural resources	0.727
2.	Integrated farming system will become more popular to improve farmers income and sustainable livelihood	Optimum resource utilization	0.687
3.	Water demand for agriculture will increase by 25 per cent in 2030	Rising population	0.680
4.	Rice wheat cropping system will gradually be replaced by less water requiring crops	Land degradation	0.673
5.	Reduction in the quantity of total pesticides used in agriculture by 18.30 MT	Increasing health consciousness	0.670
6.	Doubling horticultural crop-dedicated areas to 15.11 per cent from the existing 7.58 per cent of total cultivated area	Rising urbanization and domestic demand	0.660
7.	Large scale promotion of food and agri processing industries will enhance farmers income	Profit maximisation	0.660
8.	Approximately 10 per cent increase in forest and tree cover across the state	Climate change	0.660
9.	Micro irrigation techniques, waste water treatment, rain water harvesting and artificial recharge structures will address water scarcity	Increasing water demand for farm and non-farm sectors	0.660
10.	Proportion of area under non food crops will increase	Profit maximisation	0.653
11.	Branding of products (with registered trademark and logo) including rice, baby corn, mushrooms, bio-fertilizers, honey, vegetables, fruits etc. will attract more stakeholders from inside and outside the country	Profit maximisation	0.647
12.	Per capita consumption of pulses, edible oils, fruits, vegetables and milk in the state will increase by 28 to 75 per cent.	Increasing purchasing power and health consciousness	0.640
13.	Increase of Agri start ups in post harvest processing sector	Profit maximisation	0.640
14.	Protected agriculture would serve as road map for promoting peri urban horticulture in the state	Profit maximisation	0.627
15.	More number of custom hiring centres will emerge for popularisizing machines (like cotton picker, sugarcane harvester, straw management system machines, paddy transplanters, vegetable graders, advanced techniques like drones and robotics)	Rising labour cost	0.627
16.	Demand – supply gap of oilseed and pulses will be narrowed	Optimum resource utilization	0.627

17.	Bee keeping as a venture for rural landless and unemployed youth	Profit maximisation	0.627
18.	Organized marketing system will get developed for cut flower, mushroom and spices so as to promote exports	Increasing market orientation	0.620
19.	Use of manual labour will be only 20 per cent as compared to present time	Rising mechanization	0.620
20.	Egg and meat consumption will further rise by 30 per cent	Changes in consumption pattern	0.613
21.	Fish production in the state will rise 5 times that of present (current production- 2.9 lakh tones, 2020)	Optimum resource utilization	0.613
22.	Adoption of mushroom will get promoted among vegetarian population	Health consciousness	0.607
23.	Intensification of agri-infrastructural linkages such as cold chain, storage and warehouses and road connectivity increase efficiency	Higher profit realization	0.600
24.	There will be higher attention from small and marginal farmers for organic vegetable farming Dairy and animal related driving forces	Profit maximization	0.587
25.	Direct sale of milk and milk products from producer to consumer will increase and number of middlemen will decrease.	Profit maximization	0.667
26.	Number of smallholder cattle and buffalo farmers will decrease and number of large farms will increase	Economic viability due to economies of scale	0.647
27.	Increased mechanization in dairy farming with automated milking parlours, silage bags, milk chilling and cooled transportation	Low dependence on labour and profit maximization	0.647
28.	AI coverage in buffalos will increase from 50 per cent to 75 per cent	Technological backstopping	0.640
29.	More than 50 per cent of livestock holding will be with landless farm families	Reduction in land availability for agriculture	0.633
30.	Total agriculture income from dairy will increase from 30 per cent to 35 per cent	Profit maximisation	0.627
31.	Goat farming will flourish as a successful business enterprise	Change in food consumption pattern	0.620
32.	Promoting fodder banking, silage making and distribution of mineral mixture will get top priority		0.600
33.	Fewer new poultry farms may be set up due to recent stringent pollution control norms	High cost and poor availability of land	0.600
34.	Per capita availability of milk will be greater than 1,250g per day	Value addition	0.593
35.	Dairy with buffalo farming to get boost at the cost of crossbreds and local cows due to problems in disposal and marketing of unwanted cows and males.	Market orientation	0.620
36.	More number of farms shall adopt silage feeding, machine milking	Profit maximization	0.587
37.	Diversification in poultry in terms of emu, turkey, quail and backyard poultry will be promoted more.	Higher income generation	0.633
38.	Many individual farmers, SHG's and PFO's to start processing milk for value addition at local level	Value addition for profit maximization	0.607
39.	Establishment of commercial goatry will take root due to high demand for goat meat in NCR	Entrepreneurships for profit	0.613
40.	More self employment opportunities through large scale organized dairies	Profit maximisation	0.647

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| 41. | Value added dairy products will get high demand (like cholesterol free ghee, Mozzarella cheese, whey proteins, omega III fatty acids, fermented and fortified products, nutraceuticals and A2 milk) | Increasing health consciousness | 0.647 |
|-----|---|---------------------------------|-------|

Source: Vision-2030, Government of Haryana, 2017

Market orientation is an approach to business that prioritizes identifying the needs and desires of consumers and creating products and services that satisfy them (Kopp, 2021). Marketing the agricultural product is an important aspect of making agriculture a profitable venture. In this context, an electronic National Agriculture Market (e-NAM) has been launched by government in April 2016. The e-NAM attempts to integrate dispersed APMCs via an electronic platform and facilitate competitive price discovery to the benefit of farmers.

Statistically, urbanisation reflects an increasing proportion of the population residing in urban settlements, primarily as a result of net rural to urban migration. The percentage of the entire population living in towns and cities is referred to as the level of urbanisation. According to Census of India (2011), Haryana has 34.88 per cent of the total population living in urban areas in comparison of 31.16 per cent in India as a whole. During the first decade (2001-2011) of 21st century, there was an escalation of about 27 lakh persons in the urban population of Haryana recording the decennial growth rate of 44.25 per cent. The proportion of urban population increased to 34.88 per cent from 28.92 per cent in 2001 (Sangwan and Mahima, 2019).

Adverse impacts of mono cropping trends can be rectified only by promoting alternate cropping pattern and other remunerative income sources from allied enterprises. Diversification has huge potential in the state. So, future planning and policy making should take into account the changing trends in the farming sector of the state.

Conclusion

Balance of agriculture and allied sectors is required for the sustainability and self sufficiency of farming in Haryana state. Adverse impacts of mono cropping trends can be rectified only by promoting alternate cropping pattern and other remunerative income sources from allied enterprises. Diversification has huge potential in the state. So, future planning and policy making should take into account the changing trends in the farming sector of the state. Study concludes that, in the near future, there will be increased efforts to reduce the use of pesticides and insecticides in agriculture. In the dairy sector, there will be greater scope for mechanization in the upcoming days. Study indicates that changes in consumption pattern, increasing market orientation, rising urbanization and profit orientation were acting as main driving forces for future changes in the farming sector of Haryana.

References

- Agricultural Statistics at a glance (2021) Department of Agriculture Cooperation and Farmers Welfare, Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, Govt. of India
- Anonymous (2011) Census Report, Office of the Registrar General and Census Commissioner, Ministry of Home Affairs, Government of India, New Delhi
- Economic Survey (2021-22) Department of Economic and Statistical Affairs. Govt. of Haryana
- Economic Survey (2021-22) Department of Economic and Statistical Affairs. Govt. of Haryana
- Economic Times (2015) India needs 333 MT grain production to meet demand by 2050. dated 03 Dec 2015. <https://economictimes.indiatimes.com/news/economy/agriculture/india-needs-333-mt-grain-production-to-meet-demand-by-2050/articleshow/50033751.cms>
- Grisham, T. (2008). The Delphi technique: A method for testing complex and multifaceted topics. *Int J Manag Projects in Business* 2 (1): 112-130
- Jat ML (2014, August). Climate smart villages in Haryana, India. *Technical Bulletin, CIMMYT-CCAFS*. Pp. 1–12.
- Kopp C (2021) Market Orientation. Investopedia. <https://www.investopedia.com/terms/m/market-orientation.asp>
- PHD Chamber of Commerce and Industry (2020) Progressive Haryana: Steady Growth Strides into the Future. PHD Research Bureau. New Delhi. retrieved from <https://www.phdcci.in/wp-content/uploads/2020/06/Progressive-Haryana-Steady-Growth-Strides-into-the-Future-1.pdf>
- Sangwan H, Mahima (2019) Growing number and size of cities in Haryana: A geographic perspective. *Int J Sci Econ Res* 4 (3): 2191-2201
- Sharma P (2021) In Haryana farmers make a slight shift towards pulses and oilseeds from paddy, millet. dated 29 Sept 2021. retrived from <https://www.tribuneindia.com/news/haryana/in-haryana-farmers->