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For kind attention of:

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

Emerging Critical Situations and Threats in India's Agricultural Economy

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Compiled and Edited by

Centre for Management in Agriculture (CMA)

Indian Institute of Management Ahmedabad

Contact: **Prof. Ranjan Ghosh**, Coordinator or
Professor **Poornima Varma**, Chairperson CMA or
Drishti Vishwanath
Research Associate
alertsbriefs@iima.ac.in

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Comparative Assessment of Cultivation of Traditional Fruits Versus Imported Cultivar Fruits in Himachal Pradesh

Key highlights

- Fruit production has a very long history in India; the distinct agro-climatic conditions and rich bio-diversity enables India to produce a wide variety of fruit crops. At present, India has emerged as the second largest producer of fruits in the world.
- Hilly states like Himachal Pradesh have been characterised with high agro-climatic suitability for production of fruits. For example, apple orchards have been promoted in the state to maximise income through spatial specialisation of compatible fruit crops rather than cultivation of traditional field crops.
- However, while high-density/early verities orchards have succeeded in transforming the income level of orchardists over time, the consequent declining productivity that has been observed has resulted in a shifting emphasis on high-density fruits plantations in the state.
- This is due to various reasons; high-density plantations yield a higher income, have a low gestation period, have easier management requirements and are highly suitable for the small agricultural holdings in the state.
- In order to enhance fruit production in the state, imported cultivars grafted onto seedling rootstocks have recently been used in production activities.
- This study undertook a comparative assessment of fruit growers cultivating traditional fruits versus fruit growers cultivating imported cultivar fruits. The sample size was 100 fruit growers in total who cultivated fruits such as apple, pears, plum and cherry.
- It was observed that the cultivation of imported cultivars is fraught with several challenges such as high cost of cultivation in comparison to traditional fruits, high incidence of disease, etc. and thus, measures to incentivise their uptake need to be introduced to enhance fruit production in the state.

Observations

- The average farm area per household was higher among cultivar fruit growers (1.35 hectare/household) in comparison to traditional fruit growers (1.13 hectares/household). Among the cultivar fruit growers, out of the total cultivated land, the largest area was under high-density apple plantations. It was observed that medium size of holdings had given more preference to high-density fruits due to the availability of additional land.
- The average number of plants per household of traditional fruit growers was calculated to be 536 (61 non-bearing and 475 bearing plants), while the average number of plants per household of growers cultivating imported cultivars was calculated to be 1763 (321 non-bearing and 1442 bearing plants). Households with larger land holding size for both traditional and imported fruit growers showed an increasing tendency to have a higher average number of plants. Furthermore, cultivar fruit growers had more plants of different fruits, as compared to traditional fruit growers due to their inclusion under high-density cultivation. The coverage capacity of traditional plants ranged from 375 to 450 plants per hectare, whereas, in the case of high-density (imported cultivars) it ranged between 1350 to 1800 plants per hectare.
- Among cultivar fruit growers, the production of high-density variety of apple was 845 boxes per household, and the production of traditional variety of apple was 971 boxes per household. In comparison, the production of apple was calculated to be 1737 boxes per household for

traditional fruit growers. Among cultivar fruit growers, the production of the high-density variety of pear, plum and cherry was calculated to be 208, 298, and 2746 boxes per household respectively. In comparison, for the traditional fruit growers, the production of high-density variety of pear, plum and cherry was 193, 99, and 938 boxes per household respectively.

- In terms of production, it was observed that the per household production of traditional and high-density fruits of all sampled fruit growers (across traditional and cultivar growers) was the highest for growers with medium sized holdings, as compared to growers with small and marginal holdings. The analysis also concluded that per farm production of all the fruits (such as apple, pears, plum and cherry) was higher among cultivar fruit growers than traditional fruit growers. However, per hectare productivity of all the selected fruits was higher among traditional fruit growers as compared to cultivar fruit growers except in the case of cherry

- The total variable cost was observed to be higher among cultivar fruit growers (Rs.2,07,985 per hectare) as compared to traditional fruit growers (Rs.1,52,084 per hectare), which was mostly incurred on the purchase of fertilizers and plant protection measures. For example, the case of pear cultivation, total variable cost was estimated to be Rs.96,122 per hectare for cultivar growers and Rs.71,749 per hectare for traditional pear growers respectively; the highest per hectare cost was incurred on plant protection measures and plucking activity. In the case of plum, the total variable cost was estimated to be Rs.86,143 for cultivar growers and Rs.57,928 per hectare for traditional plum growers.

- Assembling/grading/packing contributed to a significant component of the marketing cost among cultivar and traditional fruit growers. Households with smaller land holding sizes paid a higher marketing cost for all the fruits due to them not owning a grading and packing machine, and high human labour and machinery cost. The total marketing cost of high-density varieties of apple and pear was higher among cultivar fruit growers as compared to traditional fruit growers due to higher labour costs due to maintenance requirements, and high machinery costs.

- The per farm net returns over cost of the high-density variety of fruits among cultivar fruit growers was observed to be higher as compared to traditional varieties among traditional fruit growers. For both cultivar and traditional growers, the per farm net returns over cost was the highest for households with medium land size holdings, as compared to those with small and marginal land holdings because the former had produced the highest quantity of boxes/ farm of all the fruits and also sold the highest quantity of boxes/ farm in the market.

- Some of the major issues faced by sampled fruit growers (cultivars and traditional fruit) are documented in Table 1.

Table 1: Major Issues Faced by Sampled Fruit Growers

(Multiple responses in percentage)

Sr. No.	Issues	Marginal	Small	Medium	All
A.	**Cultivar Fruit Growers**				
1	High cost of plant	73	76	86	76
2	Less supply	82	86	100	86
3	Under size of plants	77	86	100	84
4	Featherless plants	82	86	86	84
5	Eye bud damage of plants	82	90	86	82

Sr. No.	Issues	Marginal	Small	Medium	All
A.	**Cultivar Fruit Growers**				
6	Rootless plants	91	86	86	84
7	Improper distribution of plants	68	71	71	70
8	High incidence of disease	73	81	86	78
9	Lack of proper quarantine	82	86	100	86
10	Inadequate irrigation facilities	91	95	100	94
11	Out of reach water supply under HPHDP (Himachal Pradesh Horticulture Development Project)	73	81	86	78
12	No subsidies	82	90	86	84
13	Problems of support/procurement price	91	86	71	86
B.	**Traditional Fruit Growers**				
1	High cost of plant	85	89	80	86
2	Inadequate irrigation facilities	100	100	100	100
3	Lack of knowledge about high-density cultivation	88	95	100	92
4	No subsidies	81	89	80	84
5	Unidentified rootstock of imported varieties supplied by private growers	92	89	80	90

Source: *Field Survey.*

Actions Suggested

- The survey suggests that the high cost of cultivar plants serves as a disincentive in adopting imported cultivars for both cultivar fruit growers as well as traditional fruit growers (see Table 1). Thus, cultivar plants can be provided to the farmers at subsidized rates so that more farmers find it lucrative to cultivate imported cultivars.
- Given that cultivar fruits growers face issues such as occasional unavailability or less supply of imported cultivars (stated by 86 percent of cultivar growers), availability needs to be enhanced so that the demand by cultivar fruit growers is met, and interested farmers who wish to begin cultivation are also not deterred. For cultivar growers facing issues such as under sized plants (84 percent of cultivar growers), and featherless plants (84 percent of cultivar growers), best quality cultivars must be provided so that cultivar plantations can be expanded and cultivar plants with more branches should be provided.
- Eye bud damage of plants, which has been identified as an issue by 82 percent of cultivar growers leads to losses for cultivar growers, and can be rectified by taking better care of the cultivar plants while in transit from the place of production of these cultivars till it reaches the farmers. Rootless plants (stated by 84 percent of the cultivar growers) are another issue that is caused due to negligence during the storage or transit phase and needs to be addressed similarly.
- Given that orchardists growing cultivar plants witness a higher incidence of diseases in these plants, cultivar plant health should be of prime concern for the authorities and departments dealing with them, with implementation of proper quarantine measures and better storage practices, to reduce crops getting diseases or becoming damaged.

- Market returns for cultivar plant produce in the local markets are not very lucrative, which serves to demoralise cultivar growers in terms of expanding their high density plantation. Cultivar growers are then left with the option of either sending their produce to distant markets, or selling the produce at lower price in the local market. In this context, the government can provide some support/ procurement price to the farmers in the markets.
- Given that both traditional and cultivar fruit growers face issues associated with inadequate irrigation facilities, and out of reach water supply under HPHDP, the Horticulture Department can emphasise on setting up more water tanks and enabling seamless water supply so that cultivation can be sustained and expanded, particularly incentivising the cultivation of cultivars.
- Traditional farmers are reluctant to go for cultivar production due to two major reasons; there is a lack of awareness regarding the benefits of high-density cultivation, and their past experience of private growers supplying a different rootstock (what was available, or a lower cost plant) other than what the farmer demanded so as to make money, which the farmer would only come to realise at the time of production. Thus, there is a need to organise training camps and educational courses with information on imported cultivars at the Gram Panchayat level to impart better knowledge to the farmers. Furthermore, the supply of cultivars can be regulated to a greater extent to ensure that private buyers do not dupe farmers.

For further details, contact:

Arvind Kalia,
aerchpushimla@gmail.com; Mob: 9418001760
Sujan Singh,
sujan123singh@gmail.com; Mob: 8219811032
Nisha Devi Sadrate,
nishahemta14@gmail.com; Mob: 9418902473
Vamika Darhel,
vamikadarhel@gmail.com; Mob: 7018439195
Agro-Economic Research Centre, Himachal Pradesh University, Shimla.

Dairy Sector Distress in Assam: Status of Milk Production and Demand-Supply Gap

Key Highlights

- The livestock sector is an integral part of the rural economy in Assam, and is a key source of supplementary income and livelihood for small land holders and the landless rural poor.
- According to the 20th Livestock Census released by the Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, the livestock population of Assam is 18.04 million, constituting 13 percent of India's total livestock production in India in 2019. In the same year, Assam held the 1st rank in the production of pigs, 8th rank in the production of cattle, 11th rank in the production of goat, and 19th rank in the production of buffalo among all Indian states. The livestock sector contributed 1.10 percent to the state's gross state domestic product (current prices) in 2019-20.
- In spite of having enormous livestock resources and ample potentiality as a growth engine, the state of Assam has the lowest per capita availability of milk, which is far below the national average. Assam produced only 0.45 percent of the total milk produced in India, with per capita availability of 71 gram/day against 394 gram/ day for all India. There exists a wide gap between the demand and supply of milk in Assam.

Observations

- Assam comprises only 0.97 percent of exotic

cows, 3.56 percent of non-descript cows, 0.21 percent of buffaloes and 0.90 percent of goats out of the total number in India (see Table 1A). Indigenous cattle comprise 87.96 percent of the state's total milch cattle, in contrast to only 12.03 percent of cross-bred cows.

- Productivity of the milk producing animals is low in Assam as compared to the all India average. For instance, average yield per animal in milk is only 4.50 litres/day and 1.02 litres/day for exotic cows and non-descript cows respectively. In contrast to this, the all India average for exotic cows and non-descript cows is 7.95 litres/day and 3.01 litres/day, respectively.
- In Assam, the demand-supply gap of milk was found to be (-) 229 gm/person/day against (+) 94 gm./person/day for all India (see Table 1B).
- Feed and fodder account for 80 percent of the cost of milk production, and a hike in prices of those inputs has led to an increase in production cost.

Table 1A: Status of Milk Production in Assam, in Comparison to All India, 2019

Components		Exotic/ Cross Bred Cows	Indigenous/ Non-descript cows	Buffalo	Goat
Number of Animals (in 000)	India	17674.96	35,166.85	44,767.06	36,834.31
	Assam	171.52	1,253.61	93.65	331.47
% in Assam (out of total in India)		**0.97**	**3.56**	**0.21**	**0.90**
Milk Production (000' tonnes)	India	51,259	38,574.46	91,817.14	6,098.73
	Assam	281.63	466.55	117.13	16.96
% in Assam (out of total in India)		**0.55**	**1.21**	**0.13**	**0.28**
Average Yield/ Animal (Litre/ Day)	India	7.95	3.01	5.62	0.14
	Assam	4.50	1.02	3.43	0.45

Source: *20th Livestock Census, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture and Farmers Welfare, Government of India*

Table 1B: Demand-Supply Gap in Milk in Assam, in Comparison to All India

Demand/ Requirement for Milk	300 gm/ person/ day	
Supply of Milk	India	394 gram/day/person
	Assam	71 gram/day/person
Demand-Supply Gap	India	(+) 94 gm./person/day
	Assam	(-) 229 gm./person/day

Source: *20th Livestock Census, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture and Farmers Welfare, Government of India*

Actions Suggested

- There is a need to bring in a greater number of exotic variety cows to enhance productivity and reduce the demand-supply gap in milk production. However, this requires extensive and in-depth research on the suitability and productivity of exotic breeds as per the agro-climatic conditions of the state.
- To optimize milk production and to meet the nutrient requirements for animals, balanced feeding is of utmost importance. The government can work towards ensuring an adequate supply of

feed and concentrates at a reasonable price, and extend fodder crop area by taking up barren and uncultivated land area for fodder cultivation.

- Timely vaccination of livestock should be done under observation of veterinary officers. This may boost the disease resistance capacity of the herd animals. Furthermore, veterinary infrastructure including adequate healthcare facilities for livestock, artificial insemination, well equipped laboratories for testing of adulterants, etc. should be developed.
- Livestock insurance policy should be simplified with lower premium, and it should cover each and every livestock farmer in the state.
- Easy finance with simplified norms at low interest rates should be provided for livestock rearing.

Information Sources

- Various published sources, media reports, consultation with dairy farmers and field visits in the state of Assam.

For further details, contact:

Moromi Gogoi,
ms.moromi@rediffmail.com; Mob: 9435351250
Gautam Kakaty,
gautamkakaty.1511@rediffmail.com; 9435489188
Agro-Economic Research Centre, Assam Agriculture University, Jorhat.

Nano Urea Fertilizers

Key highlights

- The Government of India is encouraging the production of Nano fertilizers in the country. In February 2021, Nano fertilizers were notified for inclusion in the Fertilizer Control Order (FCO) by the Department of Agriculture and Farmers Welfare, with permission granted for the commercial production of Nano Urea fertilizers by Indian Farmers Fertilizer Cooperative (IFFCO) for a period of three years.
- In May 2021, IFFCO formally launched Nano Urea liquid, the world's first Nano fertilizer which is commercially available. The dispatch started in subsequent months.
- IFFCO's Nano Urea contains four percent total nitrogen, having nano nitrogen particles of size 25-50nm evenly dispersed in water. It is not given as a basal dose, and is only applied through foliar application, replacing the dosage of urea given in the top dressing. Nano urea is in liquid form and is priced lower than granular urea.
- Nano Urea liquid is expected to potentially replace 13.7 million tonnes of conventional urea usage by 2023, and is being touted as a transformative development in the context of agriculture in India, and across the world.

Observations

- Nitrogen is the most crucial nutrient required as it is a major constituent of chlorophyll, proteins, and enzymes. It plays a key role in the vegetative growth of plants and is absorbed in the form of nitrate and ammonium ions depending on the crop.
- The green revolution has resulted in making chemical fertilizers an essential input for crop production. However, the application of fertilizers, particularly nitrogen fertilizers has led to several ecological and environmental impacts; such as leaching and gaseous emissions, and low nutrient use efficiency has been witnessed.
- Enhancing nutrient use efficiency with a minimal threat to the environment has become critical for our agriculture food production systems that are under strain due to a burgeoning population. In this context, production of nano agri-inputs, such as nano fertilizers have emerged as an innovative sustainable solution to fulfil all the crop

nutritional requirements and enhance nutrition use efficiency.

- Nano urea is expected to curtail the usage of urea granules, which are one of the most important and most consumed nitrogenous fertilizers in the country (around 300 lakh metric tonnes per year). Nano urea is expected to increase production of crops, reduce environmental pollution, bring down costs of logistics and warehousing, and increase crop yield and productivity in comparison to conventional urea. It is also expected to reduce the country's dependence on urea imports.
- The government has allowed the export of Nano Urea with some conditions; total export will not exceed 20% of the total production of Nano Urea fertilizer in a year and no subsidized raw material (fertilizer/urea) will be used for production of Nano Urea (Liquid) fertilizer. Sri Lanka has become the first customer of this new product. MoUs have been signed with Argentina and Brazil to set up Nano Urea plants.

Actions Suggested

- Given that the production process of Nano Urea will lower logistics and warehousing facility costs, and does not involve any energy and natural gas production constraints, manufacturing facilities can be placed at suitable locations according to the demand.
- Given that the Nano Urea product involves foliar application, rather than the traditional application into the soil, awareness needs to be created to enable this behavioural change for farmers, and to convince them of its effectiveness. To ensure higher penetration of the product among a larger number of farmers, there is a requirement of heavy advertisement and extension activities.
- To make the product more accessible for the farmers, IFFCO has signed MOUs with public sector fertilizers firms such as National Fertilizers Limited and Rastriya Chemical and Fertilizers. Being a cooperative firm, IFFCO is bound to sell the product through cooperative societies. The transfer of technology will help in exploring the new sales channels, which will lead to more product penetration.
- There is a huge potential for export of Nano Urea and more markets can be explored for this purpose.

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For further details, contact:

Nikhil Pratap Singh,
nikhils@iima.ac.in; Mob: 6397910106
Centre for Management in Agriculture,
Indian Institute of Management Ahmedabad.

विद्याविनियोगाद्विकासः
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