International Journal of Agriculture Sciences
ISSN: 0975-3710&E-ISSN: 0975-9107, Volume 10, Issue 1, 2018, pp.-4983-4986.
Available online at http://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

TREND AND GROWTH OF SMALL MILLETS PRODUCTION IN MADHYA PRADESH AS COMPARED TO INDIA

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Received: December 05, 2017; Revised: December 25, 2017; Accepted: December 26, 2017; Published: January 15, 2018

Abstract- The present study was carried out to estimate the trend and growth of area, production & yield as well as to measure the contribution of area, yield and their interaction effect on production of small millets in Madhya Pradesh and India during the period 2001 to 2015. It is observed from the study that the area and production of small millets was found to be decreased with 7.05 & 1.35 and 5.41 & 2.32 percent per year while the productivity was found to be increased by 6.13 and 3.37 percent per year in Madhya and India respectively. The study revealed that the interaction effect (1495.16%) of area & yield followed by area effect (1225.13 %) were found to be major contributor towards decrease in production of small millets in Madhya Pradesh. The yield effect (-2620.29%) was found to be negative which showed that the yield was not found to be responsible for decrease in production of small millets in Madhya Pradesh. The area and its interaction effect with yield were found to be responsible for decrease in production of small millets in Madhya Pradesh. The similar finding was also found in case of India, area effect (211.96%) followed by interaction effect of area & yield (105.51%) were found to be major contributor for decrease in production of small millets. Thus, there is an urgent need to ensure timely supply of adequate quantity of true to type seed materials with high seed quality standards at farmers' doorsteps for increasing production of small millets. Major initiative like "Initiative for Nutritional Security through Intensive Millets Promotion" (INSIMP) programmes to augment the availability of seed to farmers at an affordable price should be promoted for promoting millets production.

Keywords- Trend & Growth, Small millets, Decomposition of Small Millets.

Citation: Thakur Satyendra Singh and Sharma H.O. (2018) Trend and Growth of Small Millets Production in Madhya Pradesh as Compared to India. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 10, Issue 1, pp.-4983-4986. DOI: http://dx.doi.org/10.9735/0975-3710.10.1.4983-4986

Academic Editor / Reviewer: Togay Necat, Buragohain Rinumoni, Jagjeet Singh Gill

Introduction

The term "Millets" is used to represent many small-grained cereals. Millets crops comprise of pearl millets, sorghum, finger millets &small millets namely foxtail millets (Kagani), Kodo millets (Kodo), Proso millets (Cheena), banyard millets (Sawan) and little millets (Kutki). Millets are one of the oldest cultivated food grains known to humans and have been a stable food in Northern Africa for thousand years and was a stable food in China and India prior to popularity of fine cereals like rice and wheat. These crops have a long history of cultivation of more than 5000 years and grown in many States.

Millets are highly known for rich in nutrients- vitamins, minerals and essential fatty acids also have benefits in terms of prevention of degenerative diseases besides their known functions of preventing nutritional deficiency diseases. Being non-glutinous, millets are safe for people suffering from gluten allergy and celiac disease. They are non-acid forming, easy to digest and non-allergenic [1].

Millets is also rich in health-promoting phytochemicals like polyphenols, lignins, phytosterols, phytooestrogens and phytocyanins. These function as antioxidants, immune modulators, detoxifying agents etc. and hence protect against age-related degenerative diseases like cardiovascular diseases (CVD), diabetes, cancer etc [2]. Millets are particularly high in minerals like iron, magnesium, phosphorous and potassium. Finger millet (*Ragi*) is the richest in calcium content, about 10 times that of rice or wheat. Millets are high on fiber and low on calorie. Therefore, there is an urgent need to reintroduce many of the cereals, millets in our daily diets. In the food industry, cereal grains and plant nutrients are largely used as a major source of dietary nutrients worldwide [3].

Millet crops quite indispensable to rain fed, tribal and hilly agriculture where crop substitution is difficult. That is why it has become imperative to enhance the production and productivity of these crops to ensure food and nutritional security not only to people living in harsh and difficult terrains but also in other area with exploring the possibility of export as they can be a good choice for diabetes patients cooked just like rice and can be a good substitute of rice. Its fiber content is five times that of rice and contains low calorie content. Mixed with wheat Kodo is a good diet for diabetes patients. Protein-rich *Kutki* too is a good grain substitute for diabetics. It has 20 percent less carbohydrate than rice and wheat. Global millet production was estimated at 27.83 million tons (FAO, 2014). India is the largest producer (41.04%) in the world followed by Nigeria (11.94%). In the last two decades their importance as staple food, particularly in Asia, has been declining due to various factors that include rising incomes, growing urbanization and government policies favouring the production and consumption of fine cereals like rice and wheat. However, the same factors are driving the demand for these crops in alternative uses like feed (cattle and poultry), starch and alcohol [4]. More than 50% of the millet production is now finding its way to alternative uses as opposed to its consumption only as a staple.

In the year 2015 area of small millets in India recorded 682.33 thousand ha, with Production of 429.9 thousand t and yield 630.00 kg/ha. Madhya Pradesh covers 33.4 percent (227.7 thousand ha) of area and contributes 26.6 percent (114.5 thousand t) of production with the average yield of only503 kg/ha small millets in the country [Table-1].

Madhya Pradesh (33.4%), occupy maximum area of small millets in India, Chhattisgarh (16.5%), Uttarakhand (9.5%), Maharastra (8.4%), Gujrat (5.6%), Tamilnadu (4.8%) and Andhra Pradesh (4.1%) are found to be other major States in which cultivation of small millets are found prominent in the country[Fig-1&2].

Table-1 *Contribution of area, production & productivity of small millets of different States in India during the year 2015.*

States	Area		Production		Yield	% Yield difference over all India
	000'ha	% to total	000'ha	% to total	Kg/ha	
Andhra Pradesh	28	4.1	22	5.1	786	24.8
Arunachal Pradesh	22.7	3.3	23.8	5.5	1050	66.7
Chattisgarh	112.8	16.5	25.1	5.8	223	-64.6
Gujarat	38	5.6	41	9.5	1079	71.3
Madhya Pradesh	**227.7**	**33.4**	**114.5**	**26.6**	**503**	**-20.2**
Maharashtra	57	8.4	29	6.7	509	-19.2
Orissa	19.3	2.8	9.7	2.3	502	-20.3
Rajasthan	13.7	2	4.5	1	330	-47.6
Tamil Nadu	32.4	4.8	35.2	8.2	1085	72.2
Uttarakhand	64.5	9.5	78.1	18.2	1211	92.2
Others	66.1	9.6	47	11.1	711	12.9
All India	682.3	100	429.9	100	630	0.0

Source: Directorate of Economics and Statistics (2015)

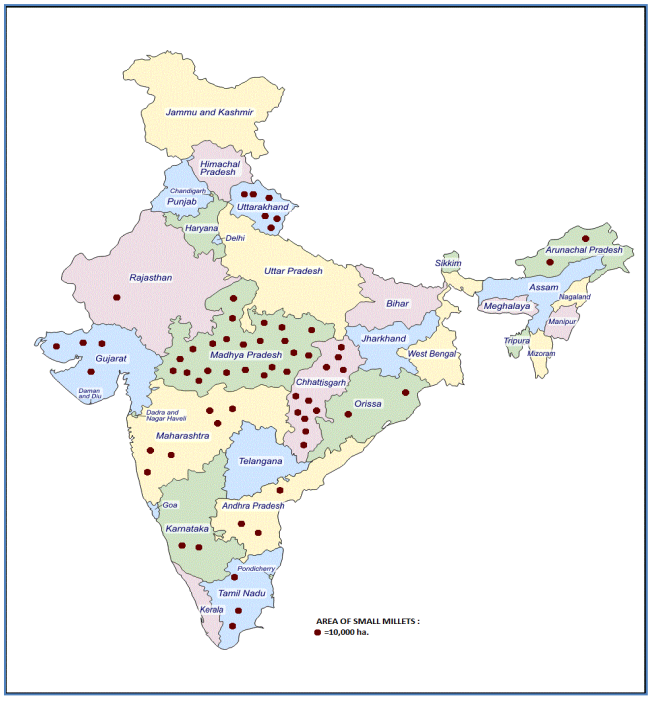

Fig-1 Small millet area in different states of India

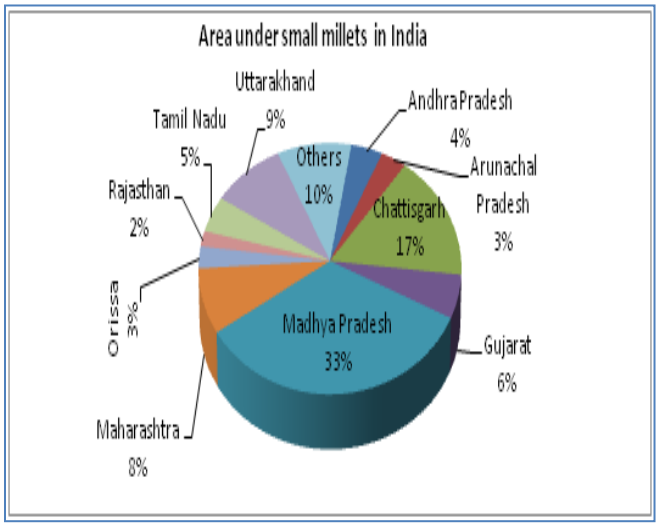

Fig-2 Share of small millets area in India

Looking to the nutritional importance of small millets and Madhya Pradesh being the leading state in trims of area and production in the country which forms the basis of livelihood and nutritional security in tribal dominating areas characterize by undulated topography and marginal lands, it has become imperative to understand to dynamic of small millets production in the state. Therefore, present study has been undertaken with the following specific objectives:

1. To analyze the growth of area, production, and yield of small millets in Madhya Pradesh.
2. To estimate the contribution of area and yield towards change in production in Madhya Pradesh.

Methodology

The present study is purely based on time series secondary data related the year 2001-15. These data have been collected from various sources viz. Agricultural Statistics of Madhya Pradesh published by Directorate of agriculture, Directorate of Economics and statistics, GoI,http://dacnet.nic.in/millets/all_indiaapy_trend.htm,http://agricoop.nic.in,http://earth360.in/web/Millets.html, Various statistical tools such as Relative change, Standard deviation, Coefficient of Variation, Trend & growth were used to draw conclusions.

The following decomposition model was used for estimation of contribution of area and yield towards change in production (positive/negative)is expressed as [5-7]:

$$\Delta P = A_o \Delta Y + Y_o \Delta A + \Delta A \Delta Y$$

Change in production = Area Effect + Yield Effect + Interaction Effect.

Area Effect: Percentage share of area in total production.

$$AE = \frac{(A_n - A_o)\, Y_o}{P_n - P_o} \quad X \; 100$$

Yield Effect: Percentage share of average yield in total production

$$YE = \frac{(Y_n - Y_o)\, A_o}{P_n - P_o} \quad X \; 100$$

Interaction Effect: Percentage share of area and yield (Simultaneous variation) interaction towards total production.

$$IE = \frac{(A_n - A_o)(Y_n - Y_o)}{P_n - P_o} \quad X100$$

Where,

A_o= Triennium average of area in base year

A_n= Triennium average of area in current year

P_o= Triennium average of production in base year

P_n=Triennium average of production in current year

$Y_o = P_o/A_o$

$Y_n = P_n/A_n$

Results & Discussion

a) Trend& Growth of Small Millets in Madhya Pradesh

The trend (b) along with relative change, co-efficient of variance, and growth of area, production and productivity of small millets have been analyzed for Madhya Pradesh and India for the period from 2001-2015 and presented in [Table-2].

It is observed from the data that the area of small millets in Madhya Pradesh was found to be decreased by 57.06 percent in the current year (194.57 thousand ha) over the base year (453.13 thousand ha) with the fluctuation of 30.43 percent and showed highly significant decline in the area with the magnitude of --21.48 thousand ha (b) per year and deceleration of annual compound growth rate by -7.05 percent per year during the period from 2001-15. In the country similar trend was observed and area was found decreased by -48.52 percent in the current

year (675.33 thousand ha) over the base year (1311.77 thousand ha) with the fluctuation of 24.67 percent and showed highly significant decline with the magnitude of -53.18 thousand ha (b) per year and deceleration of annual compound growth rate of -5.41 percent per year

Table-2 *Growth of area, production and yield of small millets in Madhya Pradesh and India during the period 2001-15*

Particulars	The Base year (TE 2003)	The Current year (TE 2015)	Absolute Change	Relative Change	Standard Deviation	Coefficient of Variance	Regression Coefficient	Annual Compound Growth Rate
Area (000' ha)								
Madhya Pradesh	453.13	194.57	-258.6	-57.06	100.13	30.43	-21.48*	-7.05
India	1311.8	675.33	-636.4	-48.52	246.9	24.67	-53.18*	-5.41
Production (000' t)								
Madhya Pradesh	94.90	90.48	-4.42	-4.66	14.85	15.96	-1.25	-1.35
India	540.97	417.14	-123.8	-22.89	65.05	13.55	-11.34*	-2.32
Yield (kg/ha)								
Madhya Pradesh	209.43	465.03	255.59	122.04	105.85	34.28	19.74*	6.13
India	412.40	617.68	205.29	49.78	80.84	16.31	16.38*	3.27

*Significant at 1% of Probability level

The production of small millets in Madhya Pradesh was found to be decreased by 4.66 percent in the current year (90.48 thousand t) over the base year (94.90 thousand t) with the fluctuation of 15.96 percent and showed an annual compound growth of -1.35 percent per year with the magnitude of 1.25 thousand ha (b) per year. In the country the production of small millets was found to be decreased by -22.89 percent in the current year (417.14 thousand t) over the base year (540.97 thousand t) with the fluctuation of 13.55 percent and showed decline in production with the magnitude of -11.34 thousand t per year and deceleration in compound growth rate of -2.32 percent per year which was found to be highly significant.

In case of yield of small millets, it was found to be increased by 122.04 (209.43 to 465.03 kg/ha) present with the fluctuation 34.28 and 16.31 percent in case of Madhya Pradesh & India respectively. The magnitude and compound growth rate were found to be increased and highly significant. The yield was found to be increase with magnitude of 19.74 and 16.38 kg/ha/year with the compound growth rate of 6.13 and 3.27 percent/year.

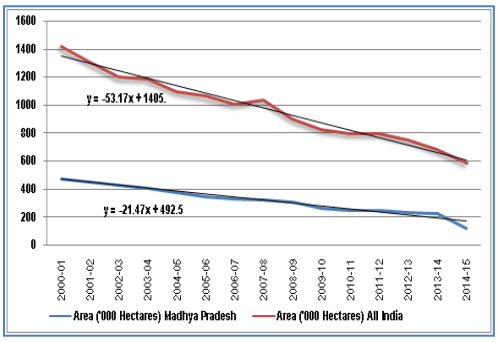

Fig-3 Trend of Area of Small Millets in Madhya Pradesh and India

The trend of area of small millets in Madhya Pradesh and India was found to be decreased with a highly significant rate [Fig-3]

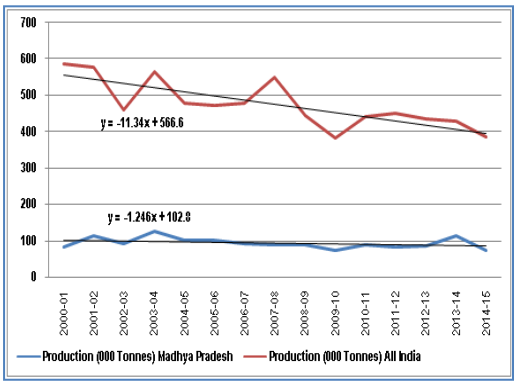

Fig- 4 Trend of Production of Small Millets in Madhya Pradesh and India

The production of small millets was found to be decreased at highly significant rate in the country but it was found non - significant in Madhya Pradesh [Fig-4], while the yield of small millets was found to be increased at highly significant rate both in the State and in the country [Fig-5].

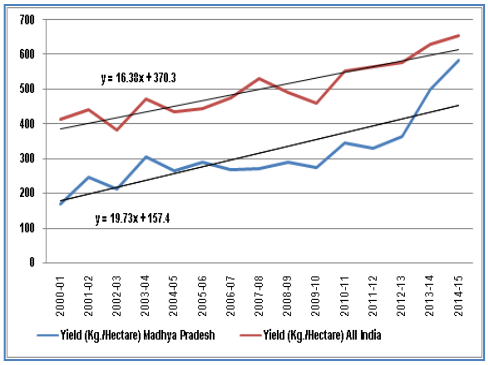

Fig-5 Trend of Yield of Small Millets in Madhya Pradesh and India.

Contribution of area and yield towards production of Small millets:

The relative contribution of area, yield and their interaction in production of small millets during the period of under study are presented in [Table-3]. It is observed from the data that the interaction effect (1495.16%) of area & yield followed by area effect (1225.13 %) were found to be major contributor towards production of small millets in Madhya Pradesh. The yield effect (-2620.29%) was found to be negative which showed that the yield was not found to be responsible for decrease in production of small millets in Madhya Pradesh. Although, the area and its interaction effect with yield were found to be responsible for decrease the production of small millets in Madhya Pradesh.

Table-3 *Contribution of area and yield towards production of Small millets (%) in Madhya Pradesh as compare to India*.

Particulars	Madhya Pradesh	India
Area Effect	1225.13	211.96
Yield Effect	-2620.29	-217.47
Interaction Effect	1495.16	105.51
Total	100.00	100.00

Source: Author's calculation

The similar finding was also found in case of India, the area effect (211.96%) followed by interaction effect of area & yield (105.51%) were found to be major contributor for decrease in production of small millets.

Conclusions

The area of small millets in Madhya Pradesh & India and production in India only were found to be decreased with increase in productivity at highly significant rate

in the state and country. The interaction effect of area& yield and area effect were found to be major contributor in production of small millets in state and country. The yield effect was found to be negative which the yield was not to be responsible for decreasing in production of small millets in state and country. Hence, it is suggested that quality seed production and distribution of improved cultivars should ensure adequate and timely supply of adequate quantities of true to type seed materials with high seed quality standards at farmers' doorsteps. The state seed committees must identify millets cultivars as per regional specific needs. Regional specific seed production should be taken up on priority basis. Extending liberal seed subsidy to the millets farmers needs to be considered and executed. State agricultural Department should take up seed production and distribution engaging NGOs, producers' companies, farmers' cooperatives and self-help groups etc. for active seed production. Opportunity for strengthening informal seed supply systems including direct trade between villages and between farmers should be encouraged in the area. Major initiative like "Initiative for Nutritional Security through Intensive Millets Promotion" (INSIMP) programmes to augment the availability of seed to farmers at an affordable price should be promoted for promoting millets production.

The nutritional superiorities of millets over others cereals are well known, its advantages are not being exploited on commercial scale. Processing and value addition technology advances have made it possible to process and made available value-added products to households. One of the limiting factors for diversified food uses of small millets is lack of appropriate processing technologies to prepare convenient ready to eat value added products. Advanced technologies such as extrusion cooking, methods of vermicelli/noodles, pasta, biscuits and other bakery products are also not available in most of the small millets. Due to these facts small millets remain un-researched and their nutritional potential is yet to be plugged in diversified ways. Therefore, processing technologies should take sufficient care while improving the consumer acceptance of millets foods the nutritional properties are retained intact.

Application of research

To encourage the small millets processing industries, concessions in form of subsidies/tax exemption while procurement of raw materials, production and processing should be given. Efforts to sensitize the government departments to introduce millets in mid-day meals scheme of school children and public distribution systems are required. The programme like INSIMP "Initiative for Nutritional Security through Intensive Millets Promotion" should be promoted in a bigger way and incentives scale with sufficient budget for promotion of millets in the State.

Awareness regarding nutritional health and environmental advantages may be created through communicational strategies so that the consumers will conscious and took the advantages of millets in their daily diet. Thus, the promotion of millets can lead to much efficient natural resource management and ultimately to a more holistic approach in sustaining agro-biodiversity along with increase in production with the help of improved technologies in the state.

Research Category: Trend and Growth of small millets production

Acknowledgement / Funding: Author thankful to Jawaharlal Nehru Krishi Vishwa Vidyalaya, Krishinagar, Adhartal, Jabalpur, 482004

***Research Guide or Chairperson of research: Dr H.O. Sharma**
University: Jawaharlal Nehru Krishi Vishwa Vidyalaya, Krishinagar, Adhartal, Jabalpur, 482004
Research project name or number: Nil

Author Contributions: All author equally contributed

Author statement: All authors read, reviewed, agree and approved the final manuscript

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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