A STUDY ON THE CURRENT STATUS AND THE CHALLENGES AHEAD FOR PULSES CULTIVATION IN MAHARASHTRA (INDIA)

Malvika Singh

Abstract- Maharashtra State is the second largest producer of pulses with 3.5 million hectare area under its cultivation. There is a huge yield gap across pulse growing districts in Maharashtra – Akola, Parbhani, Latur, Nanded and Amravati. Certain districts including Akola and Jalgaon are the major processing and trading hubs. Currently, funds have been allocated for pulse projects under NFSM and State Government projects. Seed production is by the Government bodies. Farmers receive extension of subsidies under Central and State schemes, and are offered minimum support price(MSP). But as there is always a shortage of good quality hybrid seeds, farmers see pulses as a risky crop and hence large areas are not devoted to growing pulses. Extension of subsidies to farmers does not guarantee productivity, which has lead to a situation of anxiety and depression leading to increased number of suicides in the state. Though MSP is announced, intermediate traders who procure pulses from farmers, receive maximum benefits, which is another to be addressed. The Non Government Organisations(NGOs) are not sufficiently equipped to transfer technology and to connect with consumer side. The capacity and capability could be built through private-public-partnership. A formal strategic alliance was proposed between the State Government and private players (with or without equity participation) so that research expertise and reach of various public institutes could meet the private rigor in extension services, marketing and management. The objective is to create a significant advantage combining the resources and expertise from both the sides in order to augment pulse production in India. The organized private sector can play significant role in linking up with existing business offerings and bring in other partners to fill gaps for quality seeds, information, latest technology, price transparency, logistics support, storage and handling, processing and direct reach to market. The private partners could consolidate and form farmer groups, extend PoP (field work), bring in products and services based on PoP, provide information access, banking services for payment of loans and ensure buy-back of produce. The public partner, for example, Research stations could help develop good quality seeds, State Agriculture Universities can identify the best practices and the Government Departments could provide details of working areas[1].Thus, the above highlighted issues constitute the remainder of the paper and shall be interrogated and dealt with in greater depth.

Index Terms— biotic and abiotic stress, drought resistant seeds , hybrid seeds, minimum support price ,particulate matter, pulses productivity,rainfall.

IJSER

1 INTRODUCTION

India is the largest producer and consumer of pulses in the world accounting for about 29 per cent of the world area and 19 per cent of the world's production. Even more importantly India is also the largest importer and processor of pulses in the world. Ironically, the country's pulse production has been hovering around 14– 15 MT, coming from a near-stagnated area of 22– 23 M ha, since 1990–91. Major areas under pulses are in the States of Madhya Pradesh (20.3%), Maharashtra (13.8%), Rajasthan (16.4), Uttar Pradesh (9.5%), Karnataka (9.3%), Andhra Pradesh (7.9%), Chhattisgarh (3.8%), Bihar (2.6%) and Tamil Nadu . Nutritive value of Pulse Constituents Magnitudes Protein >20-% Carbohydrate 55 – 60% Fat >1.0% Fibre 3.2% Phosphorus 300-500 mg/100 g Iron 7-10mg/100 g Vitamin C 10-15 mg/100 g Calcium 69 -75mg/100g Calorific value 343 Vitamin A 430-489 (2.9%)[2]. Pulse productivity which was 441 kg/ha in 1950 increased up to 689 kg/ha during 2011, registering 0.56% annual growth rate. Considering the case study of Maharashtra briefly, there have been various trends observed, which are likely to be found in other tropical regions of the world sharing similar climatic conditions, soil structure and rainfall patterns.

The Maharashtra state's production of pulses during 2014-15 fell by as much as 64% and cereals by 30% on account of the drought and unseasonal rains over the last few years which wrecked the kharif crop. Yields for the rabi or winter crop have also plummeted, raising concerns about the impact on prices. Maharashtra produces about 10% of the country's food grains. However, sowing over the last year fell by roughly 35% because of the poor rains, according to figures. Cash crop yields have also been hit. The production of oil-seeds was estimated to have fallen by 54% and cotton by 58% during last year's kharif season. The only crop that did well was sugarcane, which saw a 17% rise[3]. These challenges have created a situation of despair among the farmers leading to an increase in the farmer suicide rates in the state, adding to the social concern.

Market volatility and the associated risks is extremely high in case of pulse crop, kharif and rain dependent with harvest cycle ranging from 70 days to 7 months. While the State Government has regulated the price, prices need to be

rationalized and regulated across India. Noncompliance with price regulation impacts industry, private participation and R&D as new technology cannot be inducted on account of uncertainty in production.

• *Malvika Singh is currently pursuing bachelors degree program in ICT engineering with minor in Computational Science at DAIICT,Gandhinagar,email: malvikasingh2k@gmail.com,PH-+91 7043638075*

2.0 PULSES CULTIVATION SCENARIO IN MAHARASHTRA

2.1 Effect of rainfall

The below graph is a testimony to the dreaded conditions of famine which arose in the state in the year 2012, declaring it to be drought hit. Agriculture suffered as a result of this tremendously, including the pulses cultivation. It was estimated that about 114 talukas received lesser than 75 percent rainfall.

Keeping in mind these factors, the government had initiated numerous awards and schemes for the generation of pulses. Some of these included the Krishi Karman Award for highest production of pulses which saw the highest ever pulse production of 31.44 lakh tonnes during 2010-11 due to initiative like area expansion under pulses by intercrop with soyabean.

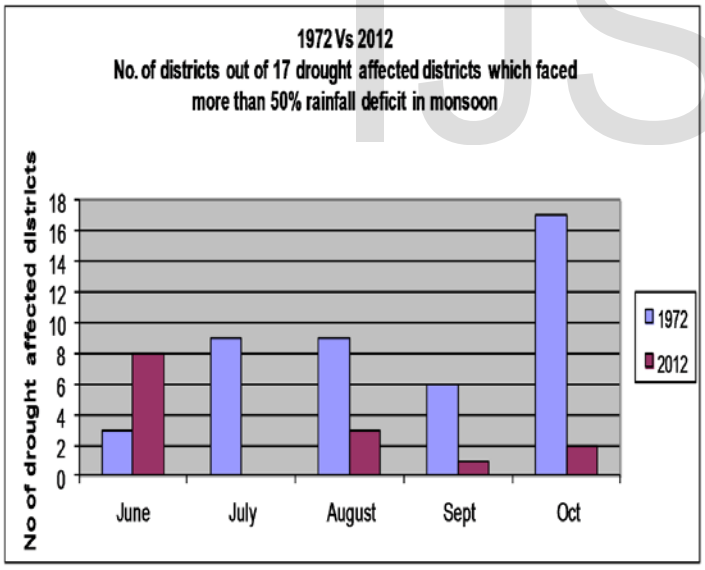

Fig. 2.1 The graph shows the comparison between the drought situations in Maharashtra in 1972 and 2012[4].

3.0 Major challenges to pulses cultivation

Listed below are the challenges that the farmers face in the production of pulses that has consequences on the overall national productivity also.

3.1 BIOTIC AND ABIOTIC STRESSES

There are various challenges that the pulses farming in India has to face on a whole encompassing the numerous states like Maharashtra. Some of these to mention are the biotic and abiotic stresses. These include, for example, the pod borers(Helicoverpa armigera), fusarium wilt, root rots, ascochyta blight and botrytis gray mold are the major biotic constraints in chickpea production.The major problems faced in pigeonpea production are pod borer, pod fly, fusarium wilt, sterility mosaic disease etc. while lentil production too faces a similar fate and is encountered by problems of biotic stresses like aphids, cutworm, rust, mildew etc.

3.2 SOIL TEXTURE AND ITS IMPACTS

The other major challenge that comes to the fore is that of the soil texture, structure and fertility. Many pulse crops are grown in low quality soils in terms of fertility, moisture content, nitrogen content and nutrition and under unpredictable weather and rainfall conditions.

3.3 UNPREDICTABLE RAINFALL

More than approximately 87 percent of the regions are dependent on natural rainfall for the pulses cultivation in India. Drought and heat stresses further aggravate the situation by reducing the produce to approximately 50 percent of that of a healthy one, especially the arid and semi arid regions of Maharashtra are at risk. Also, as a consequence of global warming, the produce is drastically affected due to temperature extremities, which in turn, also creates an adverse stress both economically and socially on the farmer's psyche. Especially the eastern parts of Maharashtra, like Yavatmal and Chandrapur are drought prone, the reason being the rain bearing clouds shedding most of their moisture on the western coast and subsequently on the plateau region, leaving very scanty rainfall for this region. Adding to the list of problems is the alkalinity of soils which is high in the Indo-Gangetic plains as well as the semi- arid regions leading to a loss in the balance of nutrient content in the soil, caused by the incessant use of fertilizers in the region.

Besides, poor drainage facilities leads to water logging which destroys the standing crops like pigeonpea, which grow closer to the ground. This phenomenon also increases the chances of diseases like phytophthora blight.

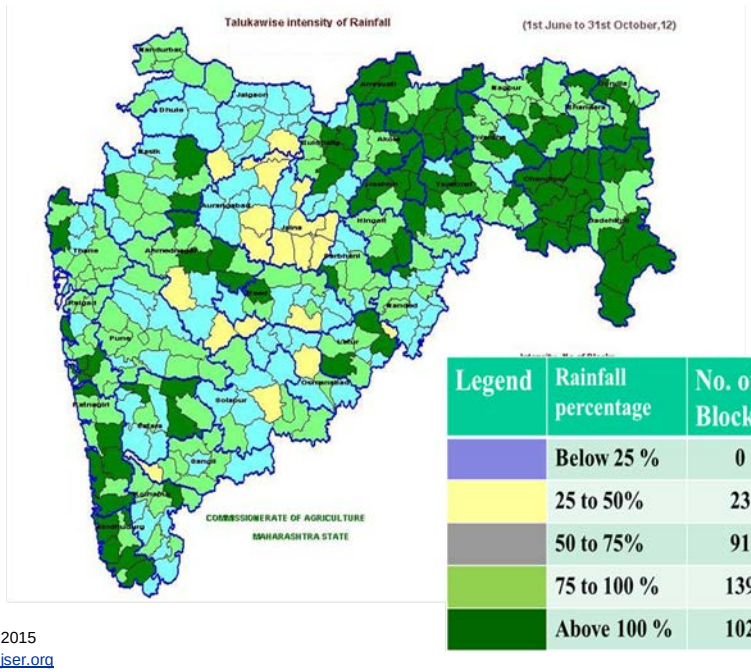

Fig. 3.3(a) The above map represents the rainfall density in various places in the states[5].

In view of the above rainfall pattern and the other problems in pulses cultivation, the Maharashtra Government has taken a few important steps. One such initiative was the Maharashtra Pulses Mission whose objective was to achieve self sufficiency in pulses production and also to motivate the farmers to grow pulses as cash crops. The National Food Security Mission was an important project included in this mission.

3.4 SOCIO-ECONOMIC CONSTRAINTS

Even though India is a major producer of pulses, it still imports pulses from other nations in certain amounts. This is due to the reason that the farmers consider pulses as a secondary crop and hence do not indulge in its production significantly.

Observing this trend and the fact that we were still not fully self sufficient in pulses, the Maharashtra Government launched the Maharashtra pulses mission with the motive to achieve self sufficiency and encourage farmers to take up pulses cultivation. Also, the farmers inputs to production is limited in terms of accessibility, due to low purchasing power for seeds, fertilizers, pesticides etc. and also in terms of market distribution, wherein these farmers have no direct influence over the market and profits earned by the middlemen. Hence, the farmers prefer growing other staple crops rather than pulses. With such negligence and low inputs, the pulses cultivation naturally suffers and also the lack of concrete policies until recently, lead to a gradual decline in quality pulses production.

Sr. No.	Crop	Yield (Kg/ha.)							% +/- (Over base year)	
		2006-07	2007-08 (Base year)	2008-09	2009-10	2010-11	2011-12	2012-13 (Kh-2nd est and Rabi-Eye Est.)	2011-12	2012-13 (Kh-2nd & Rabi Eye Estimate)
1	Tur	726	928	600	841	750	704	713	-24.14	-23.17
2	Mung	412	556	248	332	672	609	474	9.53	-14.75
3	Udid	408	568	308	332	682	678	539	19.37	-5.11
4	Gram	707	824	677	863	904	775	779	-5.95	-5.46

Table1 shows the production of different pulses in Maharashtra[6].

4.0 Looking ahead: Strategies to improve productivity of pulses

In light of the scenario and the challenges in cultivation, the government has taken several concrete steps to improve the yield as well as motivate the farmers to pursue pulses farming.The following points highlight the government's achievements as well as also gives an insight of the loopholes and probable solutions.

4.1 HIGH YIELDING VARIETY HYBRID SEEDS:

Mapping crop maturity duration to the cropping time required, including soil availability is a strategy to mitigate the draught stress. In South India, early developing chickpeas variety, particularly JG 11, KAK 2, JAKI 9218, and Vihar has created a revolution where there has been a record breaking 9-fold increase(from 95000 to 884,000 tons) in the last ten years. The key factors for this boom are (i)Introduction of high yielding hybrid seeds, Fusarium wilt resistant variety adapted to warm environments (ii)Increase in adoption of high production technologies (iii)Mechanization and proper grain storage facilities. The drought tolerant varieties provide a cost effective solution to farmers, especially those who are susceptible to drought shocks. In addition to cost effectiveness, these varieties must also be made available and distributed to the farmers. Marker-assisted back-crossing (MABC) approach has been widely used in many crops including cereals and legumes. Root traits, particularly rooting depth and root biomass, play an important role in avoidance of terminal drought through more efficient extraction of available soil moisture. MABC was initiated at ICRISAT in collaboration with the national programs in India, Kenya, Ethiopia, Tanzania. Recently, as a part of Accelerated Crop Improvement Program (ACIP) of Department of Biotechnology (Government of India), several marker-assisted breeding programs have been initiated, including MABC to incorporate drought tolerance in to high yielding varieties.[7]

4.2 FINANCIAL CRISIS MITIGATION:

Even though we have a long list of hybrid seeds being developed, their accessibility to the farmers remains constrained due to lack of resources to the farmers and inadequate demand and limited supply. This has been compounded by lack of co ordination between nation seed production organizations and the policy making institutions, with a further setback in deficiencies in demand-supply infrastructure and other socio-economic factors. The seed supply often has a dwindling business, which fails to lure in big seed companies since profits are low. More than 95% of lentil seed in India (the leading global lentil producer) comes from the informal sector (Materne and Reddy, 2007). The situation with respect to other pulses in India is similar. The seed replacement rate in India varies from 14% in chickpea to 35% in soybean (www.seednet.gov.in), thus indicating that a majority of the farmers still use their own saved seed. As small and medium seed companies are emerging and growing their presence in the market space, they are also creating effective demand for pulses seed. However their capacities are still limited by the inadequate and discontinuous access to foundation seed, inadequate capital investment, and lack of appropriate marketing strategies including delivery systems targeting remote and small scale farmers (Rubyogo et al, 2011). Public and private partnership would be the best approach to increase the availability of foundation seed need. In the developing countries such as India, particularly for pulses, the formal seed sector is highly subsidized and evolving at different stages of development. The informal seed sector is and will remain the dominant player in legumes, as estimated.[8]

4.3 Casestudy of a Village near Panvel

The region of Panvel(Panvel (T. Panvel; 18.56′ N, 73.12′ E), the chief town in the Panvel Taluka, lies on a creek about 16 miles east of Mumbai and by road 20 miles south east of Thana.

Panvel is situated on the banks of the Gadhi river (later becomes Panvel Creek)), which area was researched and the research had a different story to offer. Panvel is the largest and most populated city in Raigad district. The city also happens

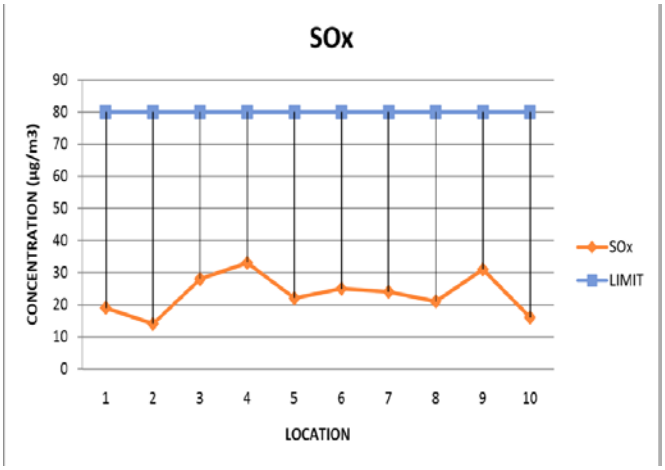

Fig 4.3 depicts comparative analysis of oxides of sulphur in ambient air samples in May 2014[10]

to be the headquarters of Panvel Taluka with more than 1000 villages under it. The development authority of Panvel is the Panvel Municipal Council (PMC) and that of New Panvel is CIDCO. The Panvel Municipal Council area is 12.17 sq. km. The villages of Panvel come under the preview of Raigad Zillah Parishad. As per the 2011 censes population of Panvel is 1, 80,464. Total number of families recorded under PMC is 43,231.[9]The region being close to Mumbai, the agriculture here was a victim of air pollution. The high concentrations of nitrogen oxides and other acidic components along with particulate matter has affected the crops grown in this region. Other major threat is that of acid rain.

4.4 Particulate Matter and its Effect on cultivation

Particulate matter such as cement dust, magnesium-lime dust and carbon soot deposited on these agricultural plants can adversely prevent the normal respiration and photosynthesis mechanisms within the leaf. Cement dust may cause chlorosis and death of leaf tissue by the combination of a thick crust and alkaline toxicity produced in wet weather. The dust coating also may affect the normal action of pesticides and other agricultural chemicals applied as sprays to foliage. In addition, accumulation of alkaline dusts in the soil can increase soil pH to levels adverse to crop growth.[11]

Fig 4.4. Cement-dust coating on apple leaves and fruit. The dust had no injurious effect on the foliage, but inhibited the action of a pre-harvest crop spray.

CONCLUSION:

India, has a large population that relies on a vegetarian diet and proteins form a very essential ingredient for a balanced diet. The point being that pulses are a chief source of protein, especially in a vegetarian diet. Hence, pulses cultivation becomes an issue of concern. Also, according to reports, it is estimated that India needs around 32 million tons of pulses by 2030 to feed its population of approximately 1.68 billion. In view of this scenario, the global production of pulses is limited and India is a major producer as well as consumer of pulses. Therefore, not only does India have the pressure of matching global standards of exports but also has to maintain indigenous production as well to feed its own nation. Improved varieties of high yielding seeds and methods of crop production are available. But these need to spread uniformly and reach out to the farmers cost effectively. The other case study revealed the monstrous effects of pollution on agriculture. The suggestive methods need to implemented immediately in order to restore the balance and harmony in nature. These include:

1)Conducting surveys to ensure and learn about the current air quality.

2)Spread awareness programmes regarding pollution control and water conservation and water harvesting techniques.

3)Prevent ground water pollution so that the water table gets replenished, as this water can be used in the dry months.

Therefore, the menace of various kinds of pollution needs immediate attention. As far as pulses production is concerned, the concerted and collective effects of the government, farmers and the researchers are bearing fruits, with initiatives like Maharashtra Pulses Mission, Krishi rewards etc. For the farmers there is also a national helpline Kisan call center which aims to clear the queries of farmers in the local languages being implemented. These efforts must continue and strengthen its momentum so that India becomes self sufficient in pulses in the years to come.

5.0 Acknowledgments

I would like to acknowledge Dr.Anil Roy,(PhD Physics IIT Delhi), Dr. Alka Parikh(PhD ,Agriculture and allied economics Cornell University, USA) and Dr. Jaideep Mulherkar(PhD Mathematics),University of California Davis,USA) of DA-IICT, Gandhinagar for giving me the opportunity to perform this research and their constant guidance in my rural internship.

I am also thankful to Humanity First Foundation(HFF),one of the largest NGO in India for its help and guidance throughout the project.

5.1 References

[1] Maharashtra – Maximum Advantage (Position Paper on Pulses) .For further detail, visit the link www.bombaychamber.com/.../1410270625**Pulses**_Position_Paper.pdf

[2] IU ARTICLE INFO, 76 Singh et al [Journal of AgriSearch, Vol.2, No.2]

[3] An article in Times of India authored by Priyanka Kakodkar published on May 28, 2015, 01.02 PM IST

[4] Picture Courtesy: Normal and 2012 Rainfall Data: http://www.mahaagri.gov.in/rainfall/index.asp

[5] Department of agriculture, Maharashtra state.Internet source,www.agricoop.nic.in/khraif2013/State/**Maharastra**.ppt

[6] Department of agriculture, Maharashtra
For futher details visit the internet site: www.agricoop.nic.in/khraif2013/State/**Maharastra**.ppt

[7] Research paper : Enhancing the Productivity and Production of Pulses in India, by C. L. Laxmipathi Gowda, S. Srinivasan, P. M. Gaur and K. B. Saxena.ViewOnline:http://oar.icrisat.org/7101/1/EnhancingTheProducti vity-2013.pdf

[8] Enhancing the Productivity and Production of Pulses in India, by C. L. Laxmipathi Gowda, S. Srinivasan, P. M. Gaur and K. B. Saxena

[9] Environment Status Report by Panvel Nagar Parishad.For further details, visit the link **panvel**nagarparishad.com

[10] Environment Status Report by Panvel Nagar Parishad

[11] Revision of Factsheet *Air Pollution on Agricultural Crops*, Order No. 85-002; Printed June, 2003,Author-Heather Griffiths - Integrated Pest Management Modelling Specialist/OMAFRA

IJSER