Constraints of growth in area production and productivity of pulses in India: An analytical approach to major pulses

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ABSTRACT

Pulses play an important role in providing a nutritionally balanced diet. These are the principal source of protein for vegetarians. India is the world’s largest producer of pulses, followed by Canada. Brazil produces large beans only. Pulses are the second main source of protein after cereals in Indian diet. India is the largest producer, consumer and importer of pulses. Basically the total pulses area occupied 26.28 million hectares which contributed production 18.10MT during 2010-11. However, the growth rate of pulses area and production were found negligible as compared to cereal like wheat and paddy and there exit wide inter states variability in their yield in the country. This study results the growth rate of area-0.09, -0.60 and 1.62 and production 1.52, 0.59 and 3.35 during 1980s, 1990s and 2000s decades, which affect the net per capita per day availability of pulses, has declined sharply from 61 gms to 32 gms from 1951 to 2010. Therefore, the gap of domestic demand and supply widen sharply. This paper analyses the status of pulses growth, and constraints of technology inadequacy as well as policy reform. The paper also focus on constraints of non-availability essential inputs i.e. quality seed, life saving irrigation, fertilizers and nutrients, price policy implication and marketing to be reoriented to bring it in tune with the emerging demand and supply of pulses in India.

Key words: Demand and supply gap, Growth and productivity, Minimum support prices.

INTRODUCTION

Pulses constitute an essential part of the Indian diet for nutritional security and environmental sustainability. Pulses are important food crops due to their high protein content 20 to 25 per cent, carbohydrates 55 to 60 per cent, rich in calcium and iron also. All pulses play a key role in improving of soil fertility through biological nitrogen fixation with the help of rhizobium bacteria found their root nodules. Thus, they play an important role to enhance the fertility of soil in term of yield of subsequent crop. Increase in yield of subsequent crop to the tune of about 20-40 per cent has been recorded (Joshi, 1998). Pulses are an effective source of reversing the process and can contribute significantly to achieving the twin objectives of increasing productivity as well as improving the sustainability of the rice and wheat-based cropping system in the IGP (Ahlawat et al. 1998; Lauren et al. 1998; Yadav et al. 1998).While the traditional cropping pattern almost always included a pulse crop either as a mixed crop or in rotation, the commercialization of agriculture has encouraged the practice of sole-cropping. The 2010 pulses production is quite encouraging, which make the India the largest producer in the World.

The area and production growth of pulses showed slow due to low productivity ranged 441 kg / hectare during 1950-51 and 688 kg / hectare during 2010-11 over six decades, however area 19.03 million hectare during 1950-51 to increased 26.68 million hectare only as compared food grain production 50.83 million tones and productivity 522 kg/hectare during 1950-51 to increase 1921 kg/hectare during 2010-11 about 4 times. However, area of pulses 26.68 million hectare and production 18.09 million tones during year 2010-11. The area of pulses ranged 18.78 to 26.28 million hectares during 6 decades and the linear trend line showed slightly upper side. However, the production and productivity of pulses had been showed more flexible and linear trend line parallel to each other slightly upper side during same period (Figure 1).

The net per capita per day availability of pulses from 61 gms to 32 gms during 1951 to 2010. The five major pulses are including first position was chickpea area 33 per cent contributed 50 per cent production followed by pigeon pea area 15 per cent contributed 17 per cent production, lentil 6 per cent area given 6 per cent production during TE
FIG 1: State wise CAGR of Total pulses during 1990-91 to 1999-00

As per these estimates, the deficit of pulses will be to the tune of 24.9 MT by 2020. The demand-supply gap pulses flagged and shortfall in pulses has been attributed to number of factor, major ones being the increasing population, rising income of the people, geographical shift, abrupt climate change, complex disease-pest syndrome, socio-economic policies and input constrains (Ali and Gupta, 2012). This coupled with other economic factor like lack of assured market, ineffective government procurement, lack of minimum support price and trade liberalization make pulses cultivation less remunerative as compared to other crops.

Objectives of Study:-
Ø To analysis the decreasing per capita availability of pulses in India.
Ø To analysis of growth and instability of area production and yield of major pulses state wise.
Ø To analysis the production and consumption of pulses in major states.
Ø To analysis the constraints of inputs growth like quality seeds, irrigation.
Ø To analysis the growth of minimum support prices of major pulse crops.

MATERIALS AND METHODS

For the purpose of this study the analysis, the secondary time series data regarding area, production and productivity pulses crops (both Kharif and Rabi) i.e. chickpea, pigeon pea, lentil, other pulses and total pulses of three decades 1980-81 to 1989-90, 1990-91 to 1999-00 and 2000-01 to 2010-11. The compound annual growth rate and instability were analyzed. The availability of input constrains and MSP of various pulses were also analyzed;

The compound growth rate model for area, production and yield were estimated using the following model.

\[ Y = ab^t \]

Where,
- \( Y \) = area / production / yield of oil seeds crops
- \( a \) = intercept and
- \( b \) = regression coefficient of Y on time t

\[ \text{CAGR in percentage} = \text{antilog} (B - 1) \times 100 \]

The instability was measured for different periods by estimating the co-efficient of variation of area, production and productivity as follows:

\[ CV = \frac{SD}{Mean} \times 100 \]

Where,
- \( CV \) = Co-efficient of variation and
- \( SD \) = Standard Deviation

RESULTS AND DISCUSSION

Analysis of CAGR of area, production and yield of different pulses and food grain: However, the annual compound growth rate of chickpea recorded the highest area 4.61 per cent, production 6.32 per cent and in yield 1.64 per cent during 2001 to 2010-11 followed by 1.26, 2.96, and 1.68 in area production and yield during 1990-91 to 1999-00 respectively. In case of Pigeonpea showed accelerated growth rate in area 2.30 per cent and production 2.89 per cent but in productivity 0.56 per cent during 1980s followed by 1.18, 2.05 and 0.87 during 90s. In the case of lentil the highest growth rate reported 5.49 per cent in production, area 1.99 per cent and productivity 3.43 during 80s followed by area 2.33 per cent and production 2.44 per cent during 90s. However, negligible growth reported during 2000s. The other pulses growth rate was reported more than 3 per cent in production and yield during 80s, however in 90s and 2000 decades reported below normal growth rate. The annual compound growth of area and production and yield of total pulses in India was low during 1980-81 to 1989-90. However, growth rate of area, production and yield of total pulses were recorded 1.62, 3.35 and 1.90 followed by food grain growth rate i.e. 0.37, 2.12 and 2.89 during 2000s (Table 1).

The state wise analysis of CAGR of area, production and yield of total pulses: As per analysis there were the highest down fall in growth rate of total pulses area (-12 per cent) in Punjab and Sikkim followed by West Bengal (-11.5per cent) and in case of production growth (-13 per cent) in Punjab followed by Sikkim (-11.81 per cent) during 1990-91 to 1999-00. The major pulses producing like Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Gujarat, Uttar Pradesh, and Andhra Pradesh states recorded decelerated positive growth in area ranged (-4.1 per cent to -6.1 per cent)
and production ranged (-0.8 per cent to -5.8 per cent) during the same period. Only few non-traditional states like Meghalaya and Nagaland recorded positive growth rate in area and production during the same period (Figure 2). The state wise growth scenario just reverses 2000-01 to 2010-11 as compared to previous decades. The Sikkim reported the highest accelerated growth rate 9.8 per cent in area and 10.1 per cent in production followed by Orissa 4.0 per cent in area and 7.4 per cent in production and however the Punjab reported decelerated growth rate (-10.4 per cent) and in production in 8.1 per cent followed Best Bengal are (-3.0 per cent and -2.2 per cent) in production (Fig 2).

### TABLE 1: Analysis of ACGR of area, production and yield of different pulses and total food grain Crops (Base: T.E.1981-82=100)

<table>
<thead>
<tr>
<th>Crops</th>
<th>1980-81 to 1989-90</th>
<th>1990-91 to 1999-00</th>
<th>2000-01 to 2010-11</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>P</td>
<td>Y</td>
</tr>
<tr>
<td>Chick pea</td>
<td>-1.41</td>
<td>-0.81</td>
<td>0.61</td>
</tr>
<tr>
<td>Pigeon pea</td>
<td>2.30</td>
<td>2.87</td>
<td>0.56</td>
</tr>
<tr>
<td>Lentil</td>
<td>1.99</td>
<td>5.49</td>
<td>3.43</td>
</tr>
<tr>
<td>Other Pulses</td>
<td>0.02</td>
<td>3.05</td>
<td>3.03</td>
</tr>
<tr>
<td>Total Pulses</td>
<td>-0.09</td>
<td>1.52</td>
<td>1.61</td>
</tr>
<tr>
<td>Total Food grains</td>
<td>-0.23</td>
<td>2.85</td>
<td>2.74</td>
</tr>
</tbody>
</table>

Source: Agriculture at a glance 2011, Ministry of Agriculture, GOI. Note: A = Area, P = Production, Y = Yield.

**Analysis state wise in stability in total pulses:** Results revealed that state wise Area instability ranged from 12 to 49 per cent however the minimum 12 per cent in Arunachal Pradesh followed by Karnataka 15 per cent and MP 16 per cent, while the maximum in Orissa 73 per cent followed by Sikkim 49 per cent in stability resulted more risk and less profitability and decreased in total area of pulses during 1990-91 to 1999 to 2000 but during 2000-01 to 2010-11 decades the scenario of pulses area instability quite positive ranged 7 to 49 per cent and up to 16 per cent recorded 12 in states and 8 per cent at national level (Table 2) showed more profitability and less risk resulted positive growth rate in area 1.62 per cent. In case of production the minimum instability 9 per cent in MP followed by 17 per cent i.e. Arunachal Pradesh, however, at national level 16 per cent and the highest 91 per cent in Orissa followed by 53 per cent in Sikkim and 41 per cent in Punjab during 1990-91 to 1999 to 2000 as compares to less instability 7 per cent followed by 12 per cent in Arunachal Pradesh and 13 per cent in Bihar however, the highest in 58 per cent in Rajasthan and 49 per cent in Kerala while at national average 15 per cent resulted increase in annual rate 3.35 during 2000-01 to 2010-11. At the yield level instability recorded ranged from 7 per cent in Uttar Pradesh to 29 per cent in Rajasthan and 9 per cent at national level during 1990-91 to 1999-00 and as compared to less reported ranged 2 in Arunachal Pradesh and Assam and maximum 39 per cent in Rajasthan during 2000-01 to 2010-11 decade which magnitude less instability in yield level states showed maximum per hectare yield level (Table 2).

**State wise area production and yield of total pulses:** There was enormous interstate variation seen in area, production and yield which can be divided in two categories i.e. major and minor pulses producing state. The Madhya Pradesh occupied the highest pulses area 4.51 million hectares contributed 3.48 million tons production with 771 kg /ha yield during TE 2009-10 respectively followed by Maharashtra pulses area 3.51 million hectares contributed 2.35 million tons production with 771 kg /hectare yield. The Rajasthan is also important pulse producing as per the area 3.68 million hectares but productivity recoded 370 kg /hectare low as compared to national average 637 kg /ha while Uttar Pradesh 791 kg /hectare and area 2.31 contributed 1.83 million tons production (Table 3). The six major pulses producing states i.e. Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Karnataka and Andhra Pradesh occupied 18.27 million hectares, 80.30 per cent area, which contributed 11.67 million tons, 80.60 per cent production, while the minor pulses producing states i.e. Chhattisgarh, Gujarat, Orissa, Bihar, Tamil Nadu and other occupied 19.70 per cent area contributed 19.40 per cent total pulses production. The remaining other Indian states area 1.99 per cent contribution 8.87 per cent production. The highest productivity 814 kg /ha was recorded in recorded in Bihar followed by 791kg/ha in Uttar Pradesh however the lowest 339 in Tamil Nadu (Table 3).
In India the five major pulses are chickpea area 33 per cent contributed 50 per cent production followed by pigeon pea area 15 per cent contributed 17 per cent production and lentil 6 per cent area given 6 per cent production. The green gram and black gram both occupied 15 per cent area contributed only 11 per cent production during TE 2010. There are 11 other minor grain legumes viz; cowpea, broad bean, dry bean, rice bean, winged bean, adzuki bean, hyacinth bean, lima bean, jack bean, zombie pea and pillipesera, which occupied about 31 per cent area, contributed only 16 per cent production (Figure 3&4). Minor grain legumes are the rich sources of dietary proteins and fibers for many people of developing world while protein content meanly twice as high as that in cereals. These are the cheap sources of quality proteins that supplementary sources of protein in cereals and thus enhance the nutritional value of cereal dominated diets.

**Share of major states area, production, yield of pulses and growth pattern:** The major pulses producing state i.e. Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Karnataka and Andhra Pradesh occupied 18.27 million hectares, 80.30 per cent area, which contributed 11.67 million tons, 80.60 per cent production. The Madhya Pradesh is the...
highest pulses producing state occupied area 21.22 per cent of total pulses contributed 29.36 per cent of total pulses (Figure 5&6), and first position chick pea 37.77 per cent of total area contributed 44.20 per cent production and in pigeon area 10.44 and production 12.49 per cent second position during 2009-10. The annual compound growth rate of total pulses was recorded 1.58, 2.64 and 2.82 the same trend followed chick pea production 2.38 per cent, 5.27 per cent and 4.47 per cent during 3 decades 80s, 90s and 2000s respectively, however the pigeon pea was recorded growth rate 2.72 and 2.36 during 80s and 2000s.

Maharashtra is the second largest pulses producing state occupied area 14.50 per cent of total pulses contributed 16.16 per cent of total pulses and in the first position in pigeon area 31.53 and production 37.28 per cent during 2009-10 and second position followed in chick pea 15.80 per cent of total area contributed 14.90 per cent production. The Maharashtra was recorded the highest annual compound growth rate 7.15, 4.69 and 4.63 of total pulses during 3 decades 80s, 90s and 2000s respectively however the pigeon pea was recorded growth rate 6.19 and 6.71 and 2.19 per cent during three decades 80s, 90s and 2000s. (Figure 5&6)

Rajasthan is the third important pulses growing state according area 16 per cent of total pulses contributed 9 per cent during 2010; (Figure 5&6) however the average yield recorded 497 kg/hectare during 2008-09 due to the unfavorable climate and biotic stresses. The Rajasthan is the important state for pulses as per area 3.67, 3.5 million hectares during 2008-09 and 2009-10 respectively and irrigated area 15 per cent. The researcher need to solve the problem of low productivity due to several reason i.e. lack of high yielding varieties adoption or non-availability of HYV at time of sowing, farmers may have lack of knowledge agronomic practices. The Rajasthan climate suited to pulses, which needed less water requirement as compared to other cereal. Uttar Pradesh, Karnataka and Andhra Pradesh also having good position in pulses production 13 per cent, 11 per cent and 8 per cent while area 10.15 per cent, 10.18 per cent and 9 per cent during TE 2010. Uttar Pradesh, Karnataka and Andhra Pradesh states more diversified as well as more crop competition crops during Kharif and Rabi season. The Chhattisgarh, Orissa and Gujarat performed better in pulses production even these are small states.

State wise productivity: In case of state wise productivity was seen lot of variation with minimum ranged 339 kg/ha in Tamil Nadu and the highest was recorded in Bihar 814 kg/ha followed by Uttar Pradesh 791 kg/ha, Andhra Pradesh 787 kg/ha and Madhya Pradesh 771 kg/ha however the national average recorded 637 kg/ha during TE 2010 (Figure 7). The state wise the highest productivity of chick pea was recorded in 1412 kg/ha during 2008-09 and slightly lower 1308 kg/ha during 2009-10 in Andhra Pradesh and followed by 1071 kg/ha in Madhya Pradesh and 863 kg/ha kg/ha in Maharashtra and the national average 915 kg/ha
during 2009-10. In case of pigeon pea the state wise the highest productivity was recorded in 989 kg/ha during 2008-09 and slightly lower 906 kg/ha during 2009-10 in Gujarat, followed by 870 Jharkhand and 850 kg/ha in Madhya Pradesh and national average recorded 711 kg/ha, however Andhra Pradesh was recorded the lowest yield 438 kg/ha during 2009-10.

Per capita per day availability of pulses and other cereals: The scenario of net per capita per day availability of pulses has fallen drastically to 41 gram during 1951 to 1990, while rice has increased to 212 gram and wheat to 133 gram during the same period. The wheat net per capita per day availability has increased more than double during four decades. The net per capita per day availability of pulses linear trend showed down side 61 to 32 gram during 1951 to 2010 (Figure 8). The net per capita per day availability of rice 222 to 185 gram also decreasing pattern and wheat seen stable 167 to 168 gram during 1991-2010. The Indian Council of Medical Research (ICMR) is recommended 65 grams availability of pulses per capita per day. The NSSO data revealed that per capita consumption of pulses has been shrinking during that the last few decades as domestic production had been lagging behind consumption requirement and imports are not adequate to bridge the supply – demand gap. This shortfall has serious nutritional implications especially to children and women in rural area.

Demand supply gap of pulses widen in India: The stagnation of domestic production ranged 14.26 to 14.66 million tones during 1990-91 to 2009-10. The India population currently growth rate 1.76 per cent, while the total pulses production growth only 0.59 per cent during 90s and 3.35 per cent currently, there was huge gap between seen in population pulses production in the country. Naturally this will be effect the increase demand of pulses in future. The study by (Kumar 1998) used the Food Characteristics Demand System (FCDS) estimates the total demand of pulses to be 30.9 MT in 2020. (Mittal Surbhi, 2006) projected pulses demand to be 42.50 MT by 2020, which is at the upper end of all the projections. As per these estimates, the deficit of pulses will be to the tune of 24.9 MT by 2020. To bridge this deficit, the growth rate of pulse production is needed 6.51 per cent, while the current growth rate is only 3.35 per cent (Figure 9), in vision IIPR 2030 stated that “in order to ensure self-sufficiency, the pulses requirement in the country is projected at 32 MT by the year 2030, which requires an annual growth rate of 4.2 per cent” (IIPR 2011). All these estimates indicated that to bridge the gap between demand and supply, pulses production should be the annual growth rate minimum 4 per cent.

The domestic demand of pulses ranged 155 to 199 lakh tons during the period 1990-91 to 2011-12 while production is less than the same period (Figure 9). The gap between domestic demand and production of pulses in the country has been widening 10 to 50 lakh million tons during aforesaid period. To bridge this demand India’s total imports of pulses during 2011–12 (Apr–Mar) were 3.4 million tons, which included 2 million tons of dry peas and dun peas (mutter), 4.71 lakh tons of pigeon pea, 4.3 lakh tons of green gram, 2.07 lakh tons of chick peas, 1.18 lakh tons of lentil, 0.63 lakh tons of kidney beans, and 0.37 lakh tons of other pulses. Major suppliers were Canada, Myanmar, Australia, the United States of America, Tanzania and China. During April to September 2012 India imported around 1.6 million tons of pulses, which included 6.37 lakh tons of dry peas, 2.98 lakh tons of green gram, 2.80 lakh tons of pigeon pea, and 0.90 lakh tons of chickpeas. Imports during the full year are likely to match or exceed 2011 12 imports of 3.4 million tons.

Constraints of pulses production and productivity: Several best efforts for increasing pulses productivity but these were...
not found revolutionary change in pulses. There are many more constraints of area, production productivity in India. The area of pulses not increase significantly as compare to wheat and rice i.e. first technological like none availability improved variety seeds, lack knowledge of package and practice, input use lack irrigation facilities or mostly depend on rain fed, lack of fertilizers minerals use and The other several reason the low productivity-low in put nature, pulses are grown as residual/alternative crops on marginal lands after preference given to staple food/income needs from high productivity-high input crops like paddy and wheat by the most of farmers. Also, they grow as rain fed crops with little or no modern yield enhancing inputs. The low priority accorded to pulses crops may be related to their relatively low status in the cropping system as treated secondary importance, in many of the farmer’s crop management attention. In addition to this, these crops are adversely affected by biotic and abiotic stress was not controlled properly (Reddy 2009). Pulse crops do not attract much the lack marketing facilities, whole prices, minimum support price and policy should be reformed from time to time, which should be beneficial to pulses growers.

**Adoption of adoption technology and high yielding varieties in pulses:** The failure of these varieties to make any change in pulse productivity could thus be due to their inherent weakness. In pulses, improved varieties hardly have a yield advantage of 15-20 per cent over the traditional varieties. Even this yield advantage did not attract the farmers to go for these varieties indicating their poor performance at the field level. Recent study by (Chand et al, 2012) on total factor productivity and returns in pulses, except green gram all other major pulses have shown either stagnation or decline in the TFP growth, indicating that these crops have not been benefited from the technological gain, even the current trend their production are not impressive and difficult to sustain. Varieties with-better yield advantage and desirable characteristics to suit the varied agro-climatic conditions need to be developed in pulses. About 530 improved varieties having resistance to major diseases have been developed for different states but inadequate supply of quality seeds remains a major stumbling block in their widespread adoption. Also, the efforts have been still inadequate in meeting the seed requirement mainly due to poor conversion of breeder seeds into foundation and certified seeds. There was lot of yield gap reported due to many reasons. The recent study (Jadhav et al, 2012) yield gap analysis in chick pea in Maharashtra resulted the per hectare in put use gap for the chick pea was maximum 98.02 to 100 percent due to manure, followed by nitrogen 41 to 63 per cent and phosphorous 30 to 76 per cent and the quality seed effected the yield 12 to 22 per cent.

The study by (Ali and Gupta, 2012) adoption of these technologies can increase pulse production by at least 13–42 per cent in the country. Improved varieties of different pulse crops hold promise to increase productivity by 20-25 per cent, whereas package technology comprising improved varieties and integrated management of nutrients and pests has shown 25-42 per cent yield advantage over the farmers’ practices in a large number of frontline demonstrations conducted across the country. Improved production technologies like raised bed planting, ridge furrow planting, seed treatment with *Rhizobium*, application of sulphur @ 20 kg/ha, pre-emergence application of pendimethalin @ 1-1.25 kg/ha, foliar spray of 2 per cent urea/ DAP, and bio-intensive IPM modules have been advocated after experimentation and large-scale frontline demonstrations. Under complex rain fed areas, the farmer participatory research (FPR) needs to be developed and involve farmers more closely in on-farm research. Farmer-participatory testing will help refine the technologies, pinpoint and eliminate adoption constraints.

**Distribution of certified/quality seeds:** The supply of certified/quality seeds of pulses were remains constant from 3.29 to 3.85 lakh tons during 1991-92 to 2000-01, while cereals seeds almost reaching to double 35.35 to 59.47lakh tons during the same period. Due the constant supply of certified/quality seed’s of pulses the productivity was also remains constant 533 to 544 kg per hectare during the 1990s decades, but pressure of population created huge demand of pulses and the import. The supply of certified/ quality seeds of pulses were increased from 3.58 to 19.69 lakh tons more than 5 times during 2000-01 to 2009-10, while cereals seeds almost reaching to tripled 59.47 to 165.15 lakh tons during the same period (Figure 10). The supply of certified/ quality seeds of pulses does not reflect the average productivity of pulses double or triple but it is hovering around 650 kg per hectare recently, while the experimental research station claimed yields were 2 to 5 tons per hectare. This revealed that Large-scale demonstrations on farmer’s fields need to be conducted with the involvement of extension agencies of ICAR, SAUs, KVKs, etc. These efforts may easily push average productivity slightly high from 637 to 737 kg/ha, that’s why farmers are not much attracted to increase area of pulses.

**FIG 10:** Distribution of certified/quality seeds

Source: Agriculture at a glance 2011, Ministry of Agriculture, GOI.
Lack of inputs fertilizer, irrigation facilities in pulses: Currently, only 16 per cent of the total area under pulses is irrigated as compared to the highest in wheat 92.8 per cent followed by rice 85 per cent and food grain 48 per cent during 2010-11. This main reason total pulses production had not been grown sharply because more than 85 per cent of pulse crops area depends on rainfall, while water is the life of any crop whether pulses or wheat or rice. It is just like step son behavior to pulses by the farming community. Indian farmers are over dozing the fertilizer nutrient and water to many crops like potato, tomato, cauliflower and wheat and rice and sugarcane. Even the potato and tomato have a lot of price risk due bumper production in frequent year. Pulses are also very remunerative crops if managed properly i.e. summer green gram was given very good return in short duration. It multiplies capital just double or triples in 3 month, such as no any business give return double in 3 month. The scheduled and controlled irrigation can lead to increase in yields in pulses also, the assured irrigation requirements for pulses are much lower than for other crops and could be provided through sprinklers, etc. All the pulses required 3 to 4 times less water as compared to rice and sugarcane.

States have been arranged in descending order of their respective production during 2010-11, irrigation and SRR pertain to 2007-08 and 2009-10 respectively. The empirical evidence in suggests that there exists a high correlation between productivity and combination of seed replacement rate (SRR) and irrigation (Table 4). This points towards an important non-price policy, i.e., the state needs to be much higher emphasis on bringing more pulses area under irrigation in tandem with increasing SRR. The Rajasthan has been minimum SSR 7.8 per cent resulted lowest yield 370 kg /ha with irrigated area 15.7 per cent however, highest SSR 56.0 per cent recorded in Andhra Pradesh with minimum irrigated area 1.5 per cent provided 787 kg /ha. Madhya Pradesh reported the highest irrigated area 37 per cent with the lowest SSR 6.4 per cent provided 771 kg /ha yield.

Minimum support price of different food grain crops and pulses: To encourage pulse production, CACP has fixed the minimum support price (MSP) the highest increase in black gram Rs. 4300 per quintal for this year, a hike of Rs. 1000 over last year 2011-12 followed by green gram Rs. 4400 per quintal for this year, a hike of Rs. 900 and pigeon pea increased only Rs. 650 over last year (Figure 11&12) while, wheat MSP increase only Rs. 1285 to Rs.1350 over the last year. The cost of production increased substantially over the past few years. The increase in support price should help farmers to offset the production cost increase. This resulted pulses production all most surge double 11 million tons to 18 million tones during 2000-01 to 2010-11.

Annual compound growth of minimum support price: The annual compound growth rate of various pulses were recorded the highest 4.87 per cent in chick pea followed by moonbeam and black gram 3.82 per cent and the lowest 2.36 per cent in pigeon pea as compared to wheat was 2.70 per cent during the 2000-01 to 2006-07, this the great set back to all pulse crop and farmers to leave growing pulses due to the less annual compound growth rate of minimum support price and the market price more than double during the same period due to the increase domestic demand of pulses while production was stagnated in same period. The farmers have refused to sell pigeon pea to the government agency at a measly MSP of Rs. 2300 a quintal when mandis are offering them more than double that rate. The traders make their work easy by paying more than the MSP and by lifting the stock from their doorstep itself. The sluggish MSP growth rate of pulses during 2000-01 to 2006-07 resulted demand surged from 11.4 to 19.2 million tons during 2000-01 to 2006-07 while, MSP increased slightly see figure 10. The domestic prices of pulses sudden bursts of high prices increased Rs. 40 to 90 almost doubled during 2009-10 the farmers shift to their land to pulses, in hope of better return, despite the high cost of production. The policy decision maker had been increased the MSP of pulses in very fast track to minimize the import bills. The highest growth rate of MSP

### TABLE 4: Area, production, yield, irrigation and SRR of pulses in major pulses producing States

<table>
<thead>
<tr>
<th>State</th>
<th>Production ('000 MT)</th>
<th>IrrigatedArea (%)</th>
<th>SRR (%)</th>
<th>Share in Production (%)</th>
<th>Yield (Kg/ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madhya Pradesh</td>
<td>3391</td>
<td>37.0</td>
<td>6.4</td>
<td>18.74</td>
<td>771</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>3146</td>
<td>9.7</td>
<td>21.0</td>
<td>17.39</td>
<td>670</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>3216</td>
<td>15.7</td>
<td>7.8</td>
<td>17.77</td>
<td>370</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>2012</td>
<td>25.7</td>
<td>19.2</td>
<td>11.12</td>
<td>791</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>1439</td>
<td>1.5</td>
<td>56.0</td>
<td>7.95</td>
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</tr>
<tr>
<td>Karnataka</td>
<td>1497</td>
<td>6.4</td>
<td>15.0</td>
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<td>Gujarat</td>
<td>720</td>
<td>12.3</td>
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<td>778</td>
</tr>
<tr>
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<td>16.2</td>
<td>25.6</td>
<td>100.0</td>
<td>637</td>
</tr>
</tbody>
</table>

Source: Agriculture statistics at a glance, 2011. (http://agricoop.nic.in/agristatistics.htm)
was recorded 19.46 per cent in pigeon pea followed by 18.20 in green gram, 17.32 per cent in black gram and 14.56 per cent in chick and minimum in wheat 6.13 per cent during 2007-08 to 1012-13.

Marketing of pulses: Markets for pulses are fragmented due to scattered production and consumption across states. Farmers/village traders sell their marketed surplus immediately after harvest due to storage pest damage, while some large traders/wholesalers trade between major markets and hoard pulses to take advantage of speculative gains in the off-season. Due to this, farmers did not get benefit from the higher market prices of pulses. Investments in market infrastructure, cold storage, warehouses, market information systems both in public and private partnership through PPP models and viability gap funding models need to be encouraged in India.

Strategy for self-sufficiency in pulses: To achieve self-sufficiency in pulses, the projected requirement by the year 2050 is estimated at 26.5 Mt. To meet this requirement, the productivity needs to be enhanced to about 1000 kg/ha, and an additional area of about 3.0 M ha has to be brought under pulses besides reducing post-harvest losses. This uphill task has to be accomplished under more severe production constraints, especially a biotic stresses, abrupt climatic changes, emerging insect-pests, and fertilizers & micronutrient deficiency lifesaving irrigation in rabi/summer pulses. This requires a proactive strategy from researchers, planners, policy-makers, extension workers, market forces and farmers aiming not only at boosting the per unit productivity of land, but also at reduction in the production costs. The strategies which can have substantial in order to

Policy issue for pulses crop development: The National Food Security Mission (NFSM), launched in 2007, is a crop development scheme of the Government of India that aims at additional production of 2 million tons of pulses by the end of 2011-12. The scheme was approved with an outlay of Rs. 4,883 crore for the period from 2007-08 to 2011-12. A sum of about Rs. 3,381 crore has been spent till 31 March 2011. The Mission interventions consist of a judicious mix of proven technological components covering seeds of improved variety, soil ameliorants, plant nutrients, farm machines/
implements, and plant protection measures. In addition, a special initiative to Accelerated Pulses Production Programme was initiated in 2010 to boost the production of pulses by active promotion of technologies in 1,000 clusters of 1,000 ha each. Considerable achievements under the NFSM have been recorded during the course of implementation of the programme such as new farm practices, distribution of seeds of high yielding varieties of pulses and treating area with soil ameliorants to restore soil fertility for higher productivity. Through targeted interventions, the mission has already achieved, a year in advance, 25 MT of additional production of food grains exceeding the target of 20 MT of production set for the terminal year 2011-12, of the Eleventh Year Plan. The government of India has taken several initiatives to motivate farmers to grow more pulses and to increase pulse production in the country. Increase in Minimum Support Price of pulses has also led to increase in the area coverage under pulses from 22.76 million hectares in 2004-05 to 25.43 million hectares in 2011-12. The productivity of pulses has significantly increased from 577 kg per hectare in 2004-05 to 679 kg per hectare in 2011-12. Pulses production strategies, along with a mix of policy and programmatic support have contributed significantly to the path breaking achievement of 18.24 million tons in 2010-11. Production of pulses is estimated marginally lower at 17.28 million tons in 2011-12. The revamped multi-pronged strategy on pulses implemented in 2010-11 has shown an immediate positive response in the quantum jump in production of pulses reaching a figure of 18.24 million tons during 2010-11 over an earlier stagnating production of about 14.5 million tons. Increased production was reflected in a reduced import of pulses that declined from 3.51 million tons during 2009-10 to 2.59 million tons during 2010-11. The programmes this the great set back to all pulse crop and farmers to leave growing pulses due to the less annual compound growth rate of minimum support price and the market price more than double during the same period due to the increase domestic demand of pulses while production was stagnated in same period more sharply focused for better monitoring and assured delivery of planned inputs and services to the farmers. Minimum Support Price was increased by more than 30%. Budgetary allocation was increased three fold with the announcement of new initiatives. Initiation of new initiative of Integrated Development of sixty thousand Pulse Villages Scheme in 2010-11 to enhance pulses production in selected watershed areas in major pulses growing states. During 2011-12, 11 pulses growing states constituting nearly 90% of the pulses areas are provided funds for in-situ moisture conservation- new farm ponds with polythene lining and/or dug wells, seed mini-kit’s A3P units, and market linked extension support through Small Farmers Agri-Business Consortium. A major increase in the productivity of pulses has been noticed in the states of Maharashtra and Uttar Pradesh. The increase in total production of pulses has been onaccount of improvement in production levels of pigeon pea, black gram and green gram. The average annual growth rate of area, production and yield of pulses increased significantly during 2000-01to 2010-11.

CONCLUSION

The inflow and outflow of pulses from India to the rest of the world have brought certain important impact on country’s economy. This study results the slow growth rate of area -0.09, -0.60 and 1.62 and production 1.52, 0.59 and 3.35 during 1980s, 1990s and 2000s decades, which affect the net per capita per day availability of pulses, has declined sharply from 61 gms to 32 gms from 1951 to 2010. Therefore, the gap of domestic demand and supply widen sharply due the minimum support price during 2001 to 2006 was increase very slow while input cost increase sharply so cost benefit ratio deceased in pulses as compared to other crops. The minimum support price should be greater coordination with farm harvest price and market price. The Inputs constraints particularly quality seeds, fertilizers and lifesaving irrigation growth was not enough as compared to rice and wheat crops. The green revolution effect showed in rice and wheat in some states only. Liberalized and subsidized import of pulses of India helps to meet demand-supply gaps, which occurred because of stagnation in the area under cultivation, very slow growth in yield, poor increase in production and speedy increase in population. These imports also help to slow down the faster increase in the prices of different types of pulses items. Import of pulses helps to slow down the decrease in the net per capita availability of food grains. Ban on export and re-export of pulses make the closure of Indian pulses processing units. Problems of Indian pulses economy can be solved with the increase the sources of production. Effective and continuous efforts are needed to increase the area under cultivation as well as the yield of pulses.

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