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Role of NFSM in Improving Productivity: A Case Study of select Crops in Karnataka

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ABSTRACT

As India was facing an acute food deficit challenges , in order to get rid of lack of food supply as per demand of the growing population , the Government of India initiated in the year 2007-08 at the onset of the 11th five year plan the National Food Security Mission (NFSM).Since 2014-15 NFSM aimed at improving commercial crops such as sugarcane, cotton, and jute yield and thus, further diversified domestic market. Therefore, the present study was undertaken to compare yield and total cost per acre for cereals , pulses and oilseeds under NFSM programme and Non NFSM, to assess empirically the impact of seeds , fertilizers ,human labour , machine labour, farmyard manure and fertilizer on yield of pulses and rice ,to examine quantitatively the impact of interventions on output/yield of crops(rice, wheat and cereals) under the NFSM programme in Karnataka for 11th and 12th FYP .The study is entirely based on secondary data and used multiple regression technique to find out the impact coefficients. The findings of the study suggested that there is a direct relationship between output and interventions(miscellaneous ,extension , subsidies , mechanization, plant protection , local initiatives and soil nutrients) for rice, wheat and pulses for 12th FYP . The study also pointed out that by increasing an efficient use of fertilizers, seeds, farmyard manure and electricity the maximum output could be achieved. Findings of the study indicated that a) Human labour and fertilizers, has positive impact on yield in case of pulses , b) seeds , human labour , farmyard manure and fertilizers has positive impact on yield in case of rice and have significant impact coefficients. It means a unit increase in seeds ,human labour, farmyard manure and fertilizers causes increase in yield. NFSM need to focus more on training oriented programmes, agriculture based infrastructural development and advanced farming technologies in order to achieve optimum utilisation of the resources by way of liberal financial schemes such as provision of tractors and other agricultural inputs at subsidised rates with easy payment modes.

1. Introduction

For any , economy's social and economic stability , food security plays a crucial role and most pertinently it mainly consists of dominant factors such as optimum level of production, adequate food supply to cater suffice quantity of food production to meet the demand of the growing population. Due to increase in population ,India was facing a grave situation in terms of meeting demand of food supply even though most of the population is engaged in agricultural sector. The India's biggest threat in the path of development for policy makers and economists was to ensure food security and eradicating malnutrition of the masses (A.V.Manjunatha and Parmod Kumar,2015). Despite ensuing economic growth rapidly, during the past decades ,India has been combating the key policy challenges of hunger and malnutrition .As India was facing an acute food deficit challenges , in order to get rid of lack of food supply as per demand of the growing population , the Government of India initiated in the year 2007-08 at the onset of the 11th five year plan National Food Security Mission (NFSM) was launched(R.Roy,2014).

NFSM has been implemented to meet the shortcomings due to the rainfall shortage and vast growing population , its main focus was towards boosting the production of pulses, hybrid rice ,wheat and other agro products ,farm practices and distribution / utilisation of seeds to achieve optimum yield . Over the years , it also educated farmers in treating cultivation land area with soil ameliorants to restore soil fertility for higher productivity with an intention of contributing substantially the growth of national food production .

With a goal targeting to increasing food security domestically, NFSM has been adopting a consolidating strategy for diversification of stagnate food grain production.New initiatives taken over the past few years in order to mitigate the demand and supply disparity firstly , strategies were formulated to enhance the area of cultivation and production, and secondly to improve the techniques for augmenting food production in order to achieve the maximum output of agricultural products(Prashant Baghel ,2016).Its main focus was to expand the cultivation area for wheat and pulses and production enhancement of paddy crops resulting in the following strategies were implemented (1) Improved quality of seed (2) Focus on INM (integrated nutrient management) and IPM (integrated pest management) (3) amalgamation of new and improved methods of production. (4) availability of adequate resources (5)adaptation of improved farming techniques (6) reprocessing of soil fertility(R.Roy,2014).

Approximately,Rs 4500 crores were incurred on food grain production and its security under NFSM(Prof.Ramendu Roy,2014).The main objective of NFSM was to increase the cultivation and production of wheat rice and pulses by 8,10, and 2mln tons(Jagyaseni Nayak,2014).The NFSM also emphasised on creating employment opportunities in the rural sector. Its main focus was to hold buffer stock system to

stabilize the market prices for the period when the market was volatile with unstable prices. The implementation of NFSM policiestook place in 560 districts in the 27 states(A.V.Manjunatha and Parmod Kumar,2015). During the 11thFive year plan the wheat production was increased by 19 mln tons and rice production was increased by 12 mln tons and pulses by 3mln tons as compared to the previous years(Deepak Rathi and Hari Om Sharma ,2015).The NFSM emerged as a boon for enhancing farming economy, besides restoring state of confidence in the midst of farmers community in their crucial phase of facing agriculture based problems and agricultural yield scarcity.

2. Literature review

Shah (2012) analysed study that the impact of NFSM was very fruitful with regard to production of pulses which resulted in profitability of cultivated pulses crops at the same time also highlighted the problems faced by the farmers in its cultivation . He had significantly proven the successful rate of augmentation of pulses crops in the state of Maharashtra , since the NFSM implementing district could achieve the highest targeted output.

Grewal and Bullar (2003) examined the reduction in pulses production in pre green revolution and post green revolution , since the rabi and kharif crops low productivity and the increase of gram production in the major proportion of land respectively.He also identified at a micro level the factors responsible for mitigating the area of pulses cultivation land. He also observed that the production and productivity of pulses had a significant impact in the Maharashtra region mainly districts of Thane, Pune , Ratnagiri and Ahmadnagar.

Deodhar (1978) analysed that the awareness of the masses about the NFSM programme enhances the developmental opportunities through the society as a whole. It emphasizes that the cooperative movement initiated at the rural level by the NFSM takes towards the direction to political approach leading to economic ,social and political development.

Kher (1991) analysed that most of the farmers need technology awareness which are used to enhance the cultivation through HYV seeds ,fertilizers , irrigation technology ,etc. at the best price .The focus should be on imparting knowledge and training concerning improvised agriculture based such as marketing, fumigation, storage etc.

Sharma and Nair (1974) analysed that the adoption of prescribed practices for increasing the farming yield are not upto the expectation level and also that very low percentage of farmers were utilising the nitrogenous fertilizers in appropriate proportion.

Reddy and Pandit (1964) analysed that the farming size was increased due to consolidation of farming land of various small land owner farmers resulting in socio economic strata of farmers was enhanced considerably in the areas of education and social involvement was boosted in the interest of farmers.

Khetwal (1977) analysed that the income of the farming cultivators was increasing due to changes incorporated in the cultivation/irrigation pattern with an intention of engaging labours in the remote areas .

3. Objectives

Major objectives of the study are as below :-

1.To compare yield and total cost per acre for cereals , pulses and oilseeds under NFSM programme and Non NFSM .

2.To assess empirically the impact of seeds , fertilizers ,human labour , machine labour, farmyard manure and fertilizer on yield of pulses and rice under the NFSM programme in Karnataka for 11th FYP .

3. To examine quantitatively the impact of interventions on output/yield of crops(rice, wheat and cereals) under the NFSM programme in Karnataka for 11th and 12th FYP.

4. Research methodology

The analysis of the present study is mainly confined to 3 crops in order to analyse the yield productivity under the NFSM programme in Karnataka. The research study is entirely based on the secondary data. So far as objectives 2nd and 3rd are concerned ,the study used multiple regression technique in respect of the three crops .The study made use of data for the period 2007-08 to 2011-12 (11thFYP) and 2012-13 to 2016-17(12th FYP). A brief about the regression technique used in the study is as given below.

Model specification

$Y= \beta0 + \beta1\ X1 + \beta2\ X2 + \beta3\ X3 + \beta4\ X4 + \beta5\ X5 + E$.....Model

Y0 - Output /yield

β0-Intercept

X1-Seeds

X2-Human labour

X3-Machine labour

X4-Farmyard manure

X5-Fertilizers

E-Error term

$Output\ /yield = \beta0 + \beta1\ X1 + \beta2\ X2 + \beta3\ X3 + \beta4\ X4 + \beta5\ X5 + \beta6\ X6 + \beta7\ X7$.....Model

Y0 - Output /yield

β0-Intercept

X1-Miscellaneous

X2-Extension

X3-Seed subsidies

X4-Mechanization

X5-Plant protection

X6-Local initiatives

X7-Soil nutrients

E-Error term

5. Data analysis

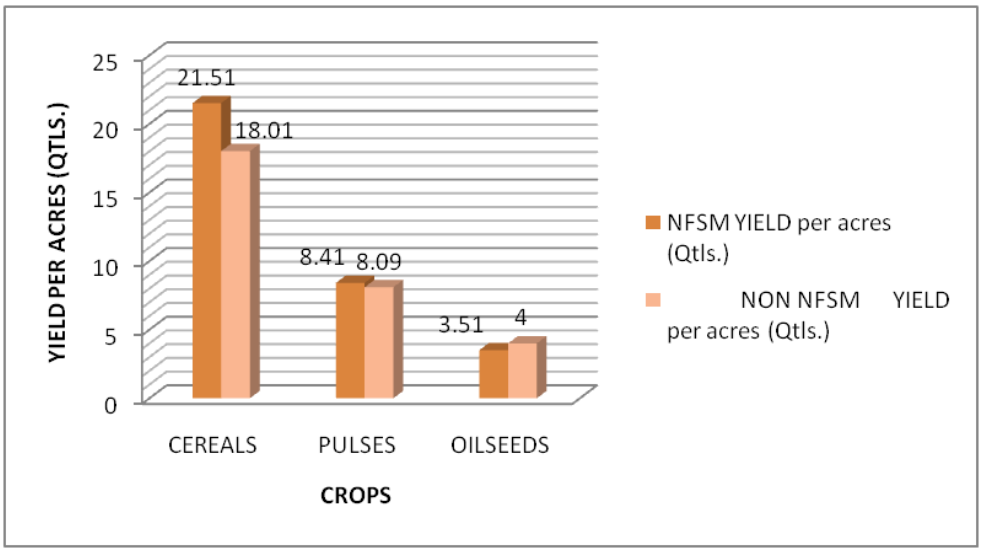
The yield per acre (Qtls.) and total cost per acre for the 3 crops under study are shown in table 1.

Table 1.Yield and Total Cost for Cereals, Pulses and Oil Seeds under NFSM and non NFSM for 11th FYP in Karnataka

CROPS	NFSM		NON NFSM	
	Yield per acres (Qtls.)	Total Cost per acre	Yield per acres (Qtls.)	Total Cost per acre
Cereals	21.51	18351	18.01	16104
Pulses	8.41	15991	8.09	13185
Oilseeds	3.51	7779	4.00	9867
Total	33.43	42121	30.01	39156

Source: A.V. Manjunatha and P.Kumar , "Impact of National Food Security Mission (NFSM) on Input use , Production, Yield ,and Income in Karnataka",2015

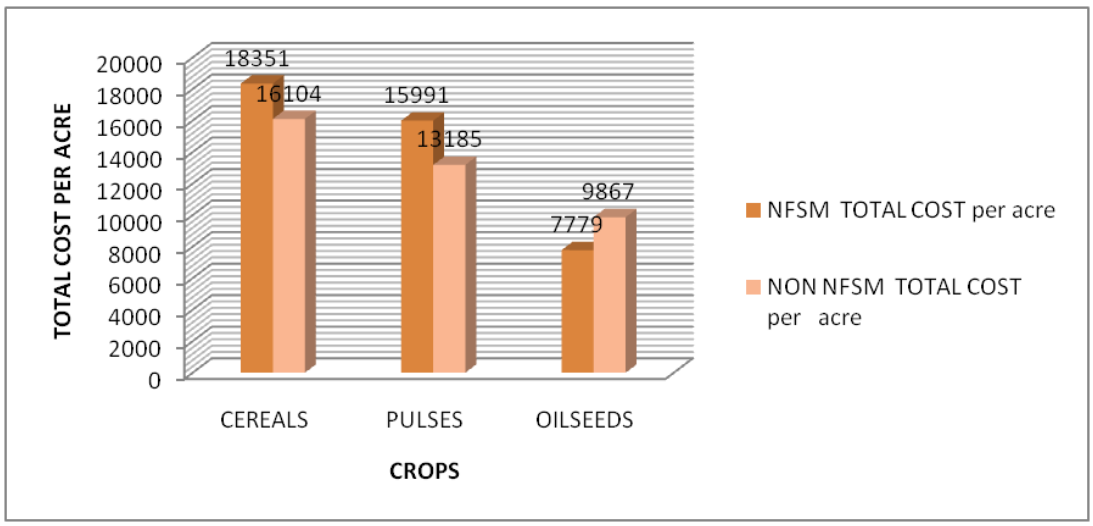
Figure 1.Yield Per Acre forCereals ,Pulsesand Oilseedsunder NFSM and non NFSM for 11TH FYP in Karnataka



Source: authors own compilation based on table 1

As the table 1 and figure 1 clearly reflects that the yield for cereals under NFSM was 21.51 Qtls per acre whereas it was only 18.01 Qtls. per acre under non NFSM. The pulses was also on a higher side under NFSM which was 8.41 Qtls. per acre as compared to 8.09 Qtls. per acre under non NFSM. However in case of oilseeds the yield per acre was less under NFSM(3.51 Qtls) per acre than under Non NFSM (4.00Qtls) per acre . But overall the total yield per acre was 33.43 Qtls. under NFSM which was more than yield under non NFSM which was 30.01 Qtls. per acre.

Figure 2. Trend of Total Cost Per Acre for Cereals ,Pulses and Oil Seeds under NFSM and non NFSM for 11TH FYP in Karnataka



Source: authors own compilation based on table 1

As the table 1 and figure 2 clearly reflects that the total cost for cereals under NFSM was 18351 per acre whereas it was only 16104 per acre under non NFSM . The pulses was also on a higher side under NFSM which was 15991 per acre as compared to 13185 per acre under non NFSM and for oilseeds the total cost was 9867 per acre under non NFSM as compared to 7779 per acre under NFSM But overall the total cost per acre was 42121 under NFSM which was more than total cost under non NFSM which was 39156 per acre.

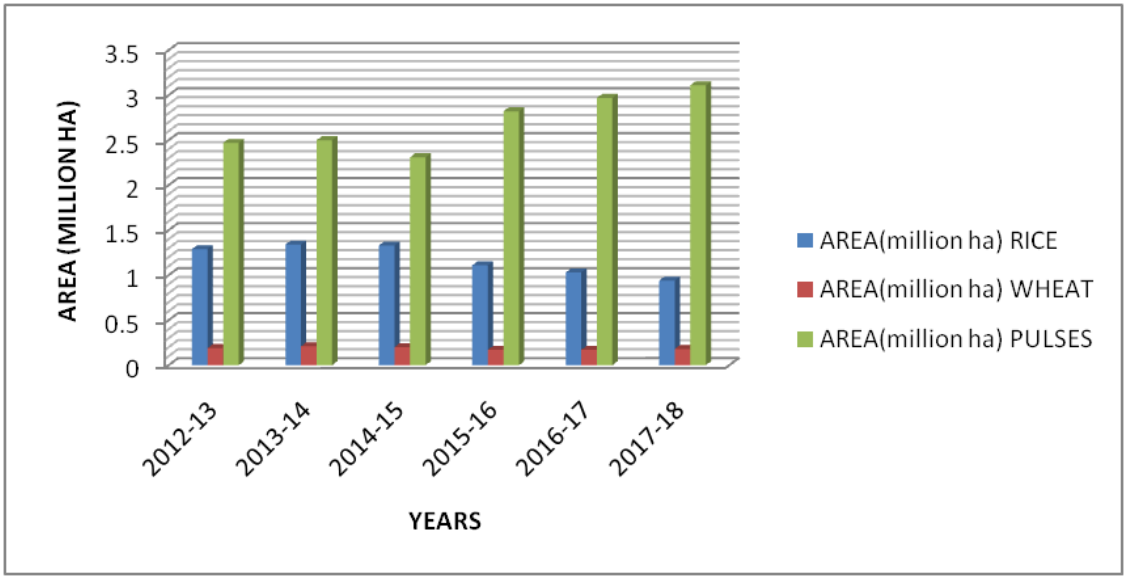
The area (mil.ha), production(miln.tn) and yield (Kg/ha) for the 3 crops under study are shown in table 1.

Table 2.Area(million ha) for Rice,Wheat and Pulses under NFSM for 12th FYP in Karnataka

YEARS	AREA(million ha)		
	RICE	WHEAT	PULSES
2012-13	1.29	0.19	2.47
2013-14	1.34	0.21	2.50
2014-15	1.33	0.20	2.31
2015-16	1.11	0.17	2.82
2016-17	1.03	0.17	2.97
2017-18	0.94	0.18	3.11

Source: Directorate of economics and statistics.

Figure 3. Trend of Area million ha for Rice, Wheat and Pulses under NFSM for 12TH FYP in Karnataka



Source: authors own compilation based on table 2

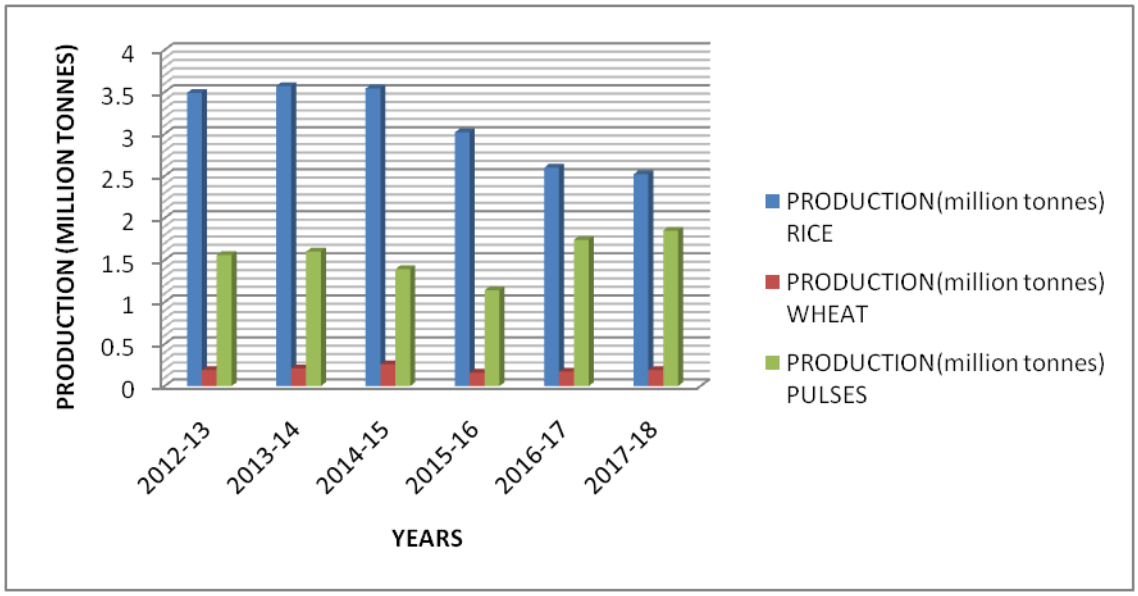
As the table 2 and figure 3 clearly reflects that the area(million ha) for rice was 1.34 million ha in 2012-13 whereas it was only 0.94 million ha in 2017-18 . The pulses was also on a higher side which was 3.11 million ha in the year 2017-18 as compared to only 2.47 million ha in 2012-13 under NFSM and for wheat area was 0.21 million ha in 2013-14 as compared to only 0.17 million ha in 2015-17 under NFSM .

Table 3 .Production (million tonnes) for Rice,Wheat and Pulses under NFSM for 12th FYP in Karnataka

YEARS	PRODUCTION(million tonnes)		
	RICE	WHEAT	PULSES
2012-13	3.49	0.19	1.56
2013-14	3.57	0.21	1.60
2014-15	3.54	0.26	1.39
2015-16	3.02	0.16	1.14
2016-17	2.60	0.17	1.74
2017-18	2.52	0.19	1.85

Source: Directorate of economics and statistics.

Figure 4. Trend of Production million tonnes for Rice, Wheat and Pulses under NFSM for 12TH FYP in Karnataka



Source: authors own compilation based on table 3

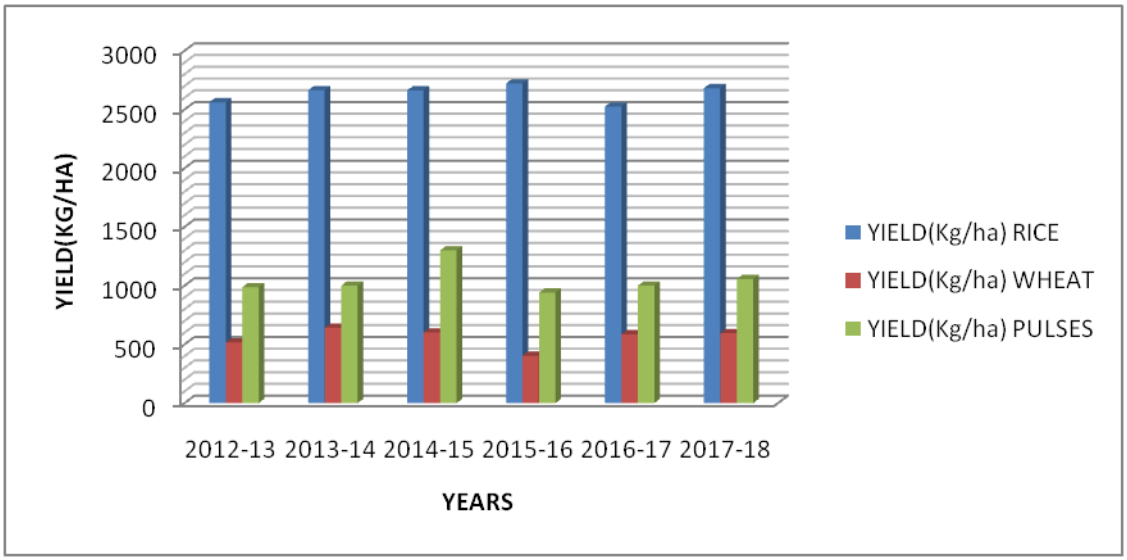
As the table 3 and figure 4 clearly reflects that the production (million tonnes) for rice was 3.49 million tonnes in 2012-13 whereas it was only 2.52 million tonnes in 2017-18 . The pulses was also on a higher side which was 1.85 million tonnes in the year 2017-18 as compared to only 1.39 million tonnes in 2014-15 under NFSM and for wheat area was 0.26 million tonnes in 2014-15 as compared to only 0.17 million tonnes in 2016-17 under NFSM .

Table 4.Yield (Kg/ha) for Rice,Wheat and Pulses under NFSM for 12th FYP in Karnataka

YEARS	YIELD(Kg/ha)		
	RICE	WHEAT	PULSES
2012-13	2561	987	516
2013-14	2664	1000	641
2014-15	2662	1300	601
2015-16	2721	941	403
2016-17	2524	1000	586
2017-18	2681	1056	595

Source: Directorate of economics and statistics.

Figure 4. Trend of yield kg/ha for Rice, Wheat and Pulses under NFSM for 12TH FYP in Karnataka



Source: authors own compilation based on table 4

As the table 4 and figure 5 clearly reflects that the yield (kg/ha) for rice was 2681 kg/ha in 2017-18 whereas it was only 2524 kg/ha in 2016-17 . The pulses was also on a higher side which was 641 kg/ha in the year 2013-14 as compared to

only 403 kg/ha in 2015-16 under NFSM and for wheat area was 1300 kg/ha in 2014-15 as compared to only 941 kg/ha in 2015-16 under NFSM .

Table 5.Inputs Used in Obtaining Yield forPulsesUnder NFSM for 11th FYP in Karnataka

yield (Qtls)	seeds (kg)	human labour (mandays)	machine labour (hours)	farmyard manure (tonnes)	fertilizer (Rs.)
8.85	11.74	86.43	23.66	8.41	251

*Source :**Directorate of economics and statistics***

Table 6. Impact of seeds, human labour ,machine labour , farmyard manure and fertilizer on output/yield for pulses under NFSM for 11th FYP in Karnataka

Regression Results

Variables	coefficients	Standard error	t stat	P- value
Seeds	0.343	0.577	0.797	0.295
Human labour	4.635	0.465	0.342	0.055
Machine labour	0.564	0.464	0.764	0.063
Farmyard manure	0.433	0.546	0.336	0.237
fertilizer	5.735	0.646	0.987	0.049

R square -0.756

Source: authors own compilation based on table 5

The values of various respective coefficients are given in the following equation as per the methodology :-

Output /yield = 9.835+ 0.343 X1 + 4.635 X2 +0.564 X3 + 0.433 X4+5.735 X5

From the above equation it is inferred that :-

- Human labour(β2-4.635,p-value- 0.055) has positive impact on yield in case of pulses and the coefficient is found significant .It means a unit increase in human labour causes 4.635 increase in yield.
- Fertilizers(β5-5.735,p-value- 0.049) has positive impact on yield in case of pulses and the coefficient is found significant . It means a unit increase in human labour causes 5.735increase in yield.
- Seeds(β1-0.343,p-value-0.295),machine labour(β3-0.564,p-value-0.063) and farmyard manure (β4-0.433 , p-value- 0.237) have positive impact on yield in case of pulses and the coefficient is found insignificant . It means a unit increase in seeds, machine labour and farmyard manure does not causes any significant increase in yield.

TABLE 7. Showing Inputs Used in Obtaining Yield for Pulses under non NFSM for 11th FYP in Karnataka

yield (Qtls)	seeds (Kg)	human labour (mandays)	machine labour (hours)	farmyard manure (tonnes)	fertilizer(Rs.)
6.43	12.27	83.05	17.78	7.23	254

*Source :**Directorate of economics and statistics***

Table 8.Impact of seeds, human labour ,machine labour , farmyard manure and fertilizer on output/yield for pulses under NON NFSM for 11th FYP in Karnataka

Regression Results

Variables	coefficients	Standard error	t stat	P- value
seeds	3.603	0.503	0.358	0.054
Human labour	0.012	0.422	0.376	0.509
Machine labour	0.336	0.014	0.797	0.882
Farmyard manure	0.354	0.538	0.328	0.489
fertilizer	5.687	0.345	2.678	0.048

R square -0.802

Source: authors own compilation based on table 7

The values of various respective coefficients are given in the following equation as per the methodology :-

Output /yield = 24.835 + 3.603 X1 + 0.012 X2 +0.336 X3 + 0.354 X4+ 5.687 X5

From the above equation it is inferred that :-

- Seeds(β1-3.603,p-value- 0.054) has positive impact on yield in case of pulses and the coefficient is found significant. It means a unit increase in human labour causes 3.603 increase in yield.
- Fertilizers(β5-5.687 ,p-value- 0.048) has positive impact on yield in case of pulses and the coefficient is found significant .It means a unit increase in human labour causes 5.687 increase in yield.
- Human labour (β2-0.012,p-value-0.509),machine labour(β3-0.336,p-value-0.882) and farmyard

manure (β4-0.354,p-value- 0.489) have positive impact on yield in case of pulses and the coefficient is found insignificant .It means a unit increase in human labour, machine labour and farmyard manure does not causes any significant increase in yield.

The regression coefficient for pulses was showing significant and positive impact of seeds and fertilizer on yield under NFSM and non NFSM which interprets that there was no significant impact on pulses yield under NFSM programme.

Table 9. Inputs Used in Obtaining Yield for Rice under NFSM for 11th FYP in Karnataka

yield (Qtls.)	seeds (Kg)	human labour (mandays)	machine labour (hours)	farmyard manure (tonnes)	fertilizer (Rs.)
20889.59	**596.38**	**7350**	**3260**	**2674**	**1064.73**

Source :H.M.NagarjunaBabu , "Impact of NFSM on Production ,Income , and food intake of households : an economic study of Karnataka ",2011

Table 10.Impact of seeds, human labour ,machine labour , farmyard manure and fertilizer on output/yield for rice under NFSM for 11th FYP in Karnataka

Regression Results

Variables	coefficients	Standard error	t stat	P- value
Seeds	5.768	0.607	3.587	0.025
Human labour	4.646	1.651	2.456	0.039
Machine labour	2.465	0.862	2.765	0.062
Farmyard manure	6.456	1.556	3.434	0.017
fertilizer	4.575	1.687	2.654	0.049

R square -0.780

Source: authors own compilation based on table 9

The values of various respective coefficients are given in the following equation as per the methodology :-

Output /yield = 0.835 + 5.768 X1 + 4.646 X2 +2.465 X3 + 6.456 X4+ 4.575 X5

From the above equation it is inferred that :-

- Seeds(β1-5.768,p-value- 0.025 has positive impact on yield in case of rice and the coefficient is found significant .It means a unit increase in seeds causes 5.768 increase in yield.
- Human labour(β2-4.646 ,p-value- 0.039) has positive impact on yield in case of rice and the coefficient is found significant .It means a unit increase in human labour causes 4.646 increase in yield.
- Farmyard manure (β4-6.456 ,p-value- 0.017) haspositive impact on yield in case of rice and the coefficient is foundsignificant . It means a unit increase in farmyard manure causes 6.456increase in yield.
- Fertilizers(β5-4.575 ,p-value- 0.049) has positive impact on yield in case of rice and the coefficient is found significant. It means a unit increase in farmyard manure causes 4.575 increase in yield.
- Machine labour (β3-2.465, p-value-0.062) have positive impact on yield in case of rice but the coefficient is found insignificant . It means a unit increase in machine labour does not cause any significant increase in yield.

Table 11. Inputs Used in Obtaining Yield for Rice under non NFSMfor 11th FYP in Karnataka

yield (Qtls.)	seeds (Kg)	human labour (mandays)	machine labour (hours)	farmyard manure (tonnes)	fertilizer (Rs.)
20784	**717.39**	**6414**	**3400**	**2163**	**835.92**

Source :H.M.NagarjunaBabu , "Impact of NFSM on Production ,Income , and food intake of households : an economic study of Karnataka ",2011

Table 12.Impact of seeds, human labour ,machine labour , farmyard manure and fertilizer on output/yield for rice under NON NFSM for 11th FYP in Karnataka

Regression Results

Variables	coefficients	Standard error	t stat	P- value
seeds	0.343	0.665	0.562	0.089
Human labour	0.253	0.345	0.432	0.745
Machine labour	0.243	0.102	0.456	0.872
Farmyard manure	0.535	0.325	0.335	0.329
fertilizer	4.322	0.544	2.655	0.058

R square -0.732

Source: authors own compilation based on table 11

The values of various respective coefficients are given in the following equation as per the methodology :-

Output /yield = 44.705 + 0.343 X1 + 0.253 X2 +0.243 X3 + 0.535 X4+ 4.322 X5

From the above equation it is inferred that :-

- Fertilizers(β5-4.322,p-value- 0.058) has positive impact on yield in case of rice and the coefficient is found significant .It means a unit increase in fertilizers causes 4.322 increase in yield.
- Seeds(β1-0.343,p-value-0.089),human labour(β2-0.253,p-value-0.745) ,machine labour(β3-0.243,p-value-0.872) ,farmyard manure(β4-0.535,p-value-0.329) have positive impact on yield in case of rice and the coefficients are found insignificant .It means a unit increase in seeds,human labour ,machine labour ,farmyard manure does not cause any significant increase in yield.

Table 13.Showing interventions Expenditure Impact on Yield for Rice, Wheat and Pulses under NFSM Programme for 11th FYP in Karnataka

yield	miscellaneous	extension	subsidies	mechanization	plant protection	local initiatives	soil nutrients
14.03	237.04	5799.4	9476.32	4253.35	3492.58	342.97	1823.78

Source :A.V. Manjunatha and Parmod Kumar , "Impact of National Food Security Mission (NFSM) on Input use , Production, Yield ,and Income in Karnataka",2015

Table 14.Impact of miscellaneous,extension,subsidies,mechanization,plantprotection,local initiatives soil nutrients on output/yield , for wheat, rice,pulses under NFSM for 11th FYP in Karnataka

Regression Results

Variables	coefficients	Standard error	t stat	P- value
miscellaneous	0.573	0.607	4.747	0.166
extension	4.712	0.401	2.567	0.039
subsidies	6.897	0.002	0.897	0.012
mechanization	4.856	0.582	3.364	0.047
Plant protection	7.839	0.001	2.678	0.016
Local initiatives	1.564	0.019	6.687	0.523
Soil nutrients	2.799	0.038	4.687	0.089

R square 0.873

Source: authors own compilation based on table 13

The values of various respective coefficients are given in the following equation as per the methodology :-

Output /yield = 0.586 + 0.573 X1 + 4.712 X2 +6.897 X3 +4.856 X4+7.839 X5+1.564 X6+2.799 X7

From the above equation it is inferred that :-

- Extension(β2-4.712,p-value- 0.039) has positive impact on yield in case of the 3 crops and the coefficient is found significant .It means a unit increase in extension causes 4.712 increase in yield.
- Subsidies (β3-6.897 ,p-value- 0.012) has positive impact on yield in case of the 3 crops and the coefficient is found significant .It means a unit increase in subsidies causes 6.897 increase in yield.
- Plant protection (β5-7.839,p-value- 0.016)has positive impact on yield in case of the 3 crops and the coefficient is found significant .It means a unit increase in plant protection causes 7.839 increase in yield.
- Mechanization (β4-4.856 ,p-value- 0.047) has positive impact on yield in case of the 3 crops and the coefficient is found significant .It means a unit increase in mechanization causes 4.856 increase in yield.
- Miscellaneous(β1-0.573 ,p-value-0.166) ,soil nutrients(β7-2.799 ,p-value-0.089) and local initiative(β6-1.564 ,p-value-0.523) have positive impact on yield in case of the 3 crops and the coefficients are found insignificant . It means a unit increase in Miscellaneous, soil nutrients and local initiative does not cause any significant increase in yield.

Table 15.Showing interventions Expenditure Impact on Yield for Rice under NFSM Programme for 12th (2012-13 to 2016-17)FYP in Karnataka

yield (kh/ha)	miscellaneous (Rs.)	Extensions (ha)	Seeds (Qtls.)	Mechanization (Rs.)	Plant protection(ha)	Local initiatives(ha)	Soil Nutrients(ha)
15813	14000	90000	13000	40105	1000	11400	1500

Source: Directorate of economics and statistics

Table 16.Impact of miscellaneous,extension,subsidies,mechanization,plantprotection,local initiatives soil nutrients on output/yield , for rice under NFSM for 12th(2012-13 to 2016-17) FYP in Karnataka

Regression Results

Variables	coefficients	Standard error	t stat	P- value
miscellaneous	1.513	0.607	4.747	0.104
extension	7.931	0.401	2.567	0.007
seeds	6.932	0.002	0.897	0.004
mechanization	1.586	0.582	3.364	0.061
Plant protection	0.412	0.001	2.678	0.131
Local initiatives	3.744	0.019	6.687	0.027
Soil nutrients	4.753	0.038	4.687	0.049

R square 0.717

Source: Authors own compilation based on table 15

The values of various respective coefficients are given in the following equation as per the methodology :-

Output /yield = 0.588 + 1.513 X1 + 7.931 X2 +6.932 X3 +1.586 X4+0.412 X5+3.744 X6+4.753 X7

From the above equation it is inferred that :-

- Extension(β2-7.931,p-value- 0.007) has positive impact on yield in case of rice and the coefficient is found significant .It means a unit increase in extension causes 7.931 increase in yield.
- Seeds (β3-6.932 ,p-value- 0.004) has positive impact on yield in case of rice and the coefficient is found significant .It means a unit increase in seeds causes 6.942 increase in yield.
- Local initiative (β6-3.744,p-value- 0.027)has positive impact on yield in case of rice crop and the coefficient is found significant .It means a unit increase in local initiatives causes 3.744 increase in yield.
- Soil nutrients (β7-4.753 ,p-value- 0.049) has positive impact on yield in case of rice crop and the coefficient is found significant .It means a unit increase in soil nutrients causes 4.753increase in yield.
- Miscellaneous(β1-1.513 ,p-value-0.104) ,mechanization (β2-1.586 ,p-value-0.061) and plant protection (β5-0.412 ,p-value-0.131) have positive impact on yield in case of rice crop but the coefficients are found insignificant . It means a unit increase in Miscellaneous, mechanization and plant protection local initiative does not cause any significant increase in yield.

Table 17.Showing interventions Expenditure Impact on Yield for Wheat under NFSM programme for 12th (2012-13 to 2016-17)FYP in Karnataka

yield (Qtls./ha)	miscellaneous(Rs.)	extension (ha)	seeds (Qtls.)	mechanization(Rs.)	plant protection(ha)	local initiatives(ha)	soil nutrients(ha)
1240	**14000**	**54000**	**3000**	**81519**	**1000**	**10500**	**1250**

Source: Directorate of economics and statistics

Table 18.Impact of miscellaneous ,extension, subsidies, mechanization ,plant protection,local initiatives soil nutrients on output/yield , for wheat under NFSM for 12th (2012-13 to 2016-17)FYP in Karnataka

Regression Results

Variables	coefficients	Standard error	t stat	P- value
miscellaneous	0.456	0.607	4.747	0.173
extension	0.486	0.401	2.567	0.168
seeds	2.597	0.002	0.897	0.066
mechanization	7.903	0.582	3.364	0.001
Plant protection	0.641	0.001	2.678	0.083
Local initiatives	5.781	0.019	6.687	0.014
Soil nutrients	0.575	0.038	4.687	0.184

R square 0.612

Source: Authors own compilation based on table 17

The values of various respective coefficients are given in the following equation as per the methodology :-

Output /yield = 0.364 + 0.456 X1 + 0.486 X2 +2.597 X3 +7.903 X4+0.641 X5+5.781 X6+0.575 X7

From the above equation it is inferred that :-

- Mechanizatio(β4-7.903,p-value- 0.001) has positive impact on yield in case of wheat and the coefficient is found significant .It means a unit increase in mechanization causes 7.903 increase in yield.
- Local initiative (β6-5.781,p-value- 0.014)has positive impact on yield in case of wheat and the coefficient is found significant .It means a unit increase in local initiatives causes 5.781 increase in yield.
- Miscellaneous(β1-0.456 ,p-value-0.173) ,extension (β2-0.486 ,p-value-0.168) seeds (β3-2.597 ,p-value-

0.066) , plant protection (β5-0.641 ,p-value-0.083) and soil nutrients (β7-0.575 ,p-value-0.184) have positive impact on yield in case of rice crop but the coefficients are found insignificant . It means a unit increase in Miscellaneous, extensions, seeds, plant protection and soil nutrients does not causes any significant increase in yield .

Table 19.Showing interventions Expenditure Impact on Yield for Pulses under NFSM Programme for 12th(2012-13 to 2016-17) FYP in Karnataka

yield(Qtls./ ha)	Miscelaneous (Rs.)	Extension (ha)	Seeds (Qtls.)	Mechanization (Rs.)	plant protection(ha)	local initiative(ha)	soil nutrients(ha)
685	14000	33000	12500	68907	1000	11400	2550

Source: Directorate of economics and statistics

Table 20.Impact of miscellaneous, extension ,subsidies ,mechanization, plant protection, local initiatives soil nutrients on output/yield , for pulses under NFSM for 12th(2012-13 to 2016-17) FYP in Karnataka

Regression Results

Variables	coefficients	Standard error	t stat	P- value
miscellaneous	0.582	0.607	4.747	0.166
extension	4.854	0.401	2.567	0.048
seeds	7.916	0.002	0.897	0.002
mechanization	8.957	0.582	3.364	0.005
Plant protection	2.539	0.001	2.678	0.071
Local initiatives	7.884	0.019	6.687	0.023
Soil nutrients	4.743	0.038	4.687	0.034

R square 0.742

Source: Authors own compilation based on table 19

The values of various respective coefficients are given in the following equation as per the methodology :-

Output /yield = 0.537 + 0.582 X1 + 4.854 X2 +7.916 X3 +8.957 X4+2.539 X5+7.884 X6+4.743 X7

From the above equation it is inferred that :-

- Extension(β2-4.854,p-value- 0.048) has positive impact on yield in case of pulses and the coefficient is found significant .It means a unit increase in extension causes 4.854 increase in yield.
- Seeds (β3-7.916 ,p-value- 0.002) has positive impact on yield in case of pulses and the coefficient is found significant .It means a unit increase in seeds causes 7.916 increase in yield.
- Mechanization(β4-8.957 ,p-value- 0.005) has positive impact on yield in case of pulses and the coefficient is found significant .It means a unit increase in mechanization causes 8.957 increase in yield.
- Local initiative (β6-7.884,p-value- 0.023)has positive impact on yield in case of pulses and the coefficient is found significant .It means a unit increase in local initiatives causes 7.884 increase in yield.
- Soil nutrients (β7-7.743 ,p-value- 0.034) has positive impact on yield in case of pulses and the coefficient is found significant .It means a unit increase in soil nutrients causes 7.743 increase in yield.
- Miscellaneous(β1-4.582 ,p-value-0.166) and plant protection (β5-0.539 ,p-value-0.071) have positive impact on yield in case of pulses but the coefficients are found insignificant . It means a unit increase in Miscellaneous and plant protection does not causes any significant increase in yield respectively.

6. Major Findings and Conclusion

The research study collected from the secondary data consists of multiple regression technique (model 1) between the output (dependent variable) fertilizers, seeds ,farmyard manure ,human labour and machine labour (independent variables) . From the regression results there is a direct relationship between output and fertilizers ,seeds ,farmyard manure ,electricity for pulses and rice . From regression results (model 2) there is a direct relationship between output and miscellaneous ,extension , subsidies , mechanization, plant protection , local initiatives and soil nutrients for rice , wheat and pulses .From this analysis we infer that output could only be increased by increasing an efficient use of fertilizers, seeds, farmyard manure and electricity and also through incurring the expenditure on providing seed subsidies, training programmes ,integrated nutrient management . NFSM need to focus more on training oriented programmes so as the resources can optimally be utilised, the tractors should be provided at subsidised rates with easy payment modes.

The major findings from the research study is given below :-

- The yield per acre and the total cost per acre for cereals and pulses are on higher side as compared to oilseeds under NFSM programme ,while oilseeds is showing high yield and total cost per acre under Non NFSM practitioners .
- Under NFSM and non NFSM practices for pulses ,the farmyard manure and machine labour contributed less in increasing the output as compared to seeds, human labour and fertilizers
- The seeds and machine labour contributed less in increasing the output under NFSM programme.

- Insufficient availability of miscellaneous interventions which includes administration and project management team by NFSM for wheat ,rice , pulses as compared to extension, seeds subsidy, plant protection and soil nutrients provided for the 11th FYP on the other hand for 12th FYP the mechanization and local initiatives were significantly available for wheat and extensions, seeds, fertilizers, local initiatives and soil nutrients were effectively available for pulses.
- NFSM amount was more allocated and spent on extension which includes demonstrations, farmers training publicity and training of extension workers as compared to amount allocated and spent on local initiatives .
- The expenditure on miscellaneous , local initiatives and soil nutrients was on a lower side as compared to extension, mechanization ,seed subsidies and plant protection for 11th FYP but on the other hand the expenditure on plant protection and miscellaneous interventions were on a lower side as compared to seeds, extension, local initiatives and soil nutrients for 12th FYP.
- Over the period the yield for cereals which includes rice, wheat and paddy under NFSM is more as compared to yield under NON NFSM .
- The yield for pulses was also on a higher side under NFSM as compared to yield for pulses under NON NFSM.
- The yield for oilseeds was also on a higher side under NON NFSM as compared to yield for oilseeds under NFSM.

7. Suggestions

- The provision of the high value cultivation mechanism such as tractors must be available at subsidised rates and with easy mode of payment plans.
- The labour saving techniques and machinery should be available to the farmers at the subsidised rates to increase the production
- The SRI and SWI method for the cultivation of rice and wheat must be adopted in a more efficient manner so that all the farmers can be covered conventionally.
- To increase the yield of crops ,the training oriented programmes should be more organised so as the awareness about the benefits of NFSM programme can be increased among the farmers in order to use the resources in an optimal way .
- More focus should be contributed in increasing the output by allocating more emphasis and expenditure on miscellaneous (administration and project management teams) , local initiatives and soil nutrients (micro nutrients ,soil amendments) under the programme
- The quality inputs should be accessible to farmers at subsidised rates .
- More emphasis must be given in increasing the demonstrations plots for NFSM rice,wheat and pulses in order to increase the awareness about the new technology among the farmers .
- From the eco friendly point of view the usage of organic manure and integrated nutrient management must be increased so the growth can be achieved in a sustainable manner.
- More focus must be on providing HYV and hybrid seeds in order to increase the productivity.

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