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Impact of PMKISAN Scheme on Production and Efficiency of Ragi (*Eleusine Coracana*) Crop of Tumkur District of Karnataka

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ABSTRACT

The PMKISAN scheme has been implemented from 1st December 2018 with income support of Rs. 6000/- per farm family in three installments of Rs 2000/- each in the beginning of crop season. The beneficiaries of PMKISAN in Karnataka are using higher inputsfor ragi cultivation. The resultant effect is increase in yield and income. The B:C ratio of ragi enterprise is higher among the beneficiary farmers as compared to non-beneficiary farmers. The presence of money has enabled the farmers to be technically more efficient as compared to non-beneficiary farmers. The beneficiary farmers have realised 9.07 per cent higher gross return as compared to non-beneficiary farmers. The beneficairies have moved up the technical efficiency ladder with greater proportion of farmers being observed with medium and above efficiency as compared to non-beneficiaries. It is therefore suggested that the scheme must be continued in future to boost the agricultural sector.

Keywords: PMKISAN Scheme, Impact evaluation, Ragi production efficiency, Decomposition Analysis, Data envelopment analysis, Adoption index

JEL: D24, E24, Q16, Q18

I

INTRODUCTION

The Central government has launched PM-KISAN (PM Kisan Samman Nidhi) Yojana with 100 per cent funding from Government of India. The scheme became operational from 1.12.2018. Under the scheme an income support of Rs.6000/- per year in three equal instalments will be provided to the beneficiaries of the scheme under Direct Benefit Transfer mode, subject to certain exclusions. Recently, the role of cash transfers has gained importance in reducing poverty and unemployment by politicians and policymakers in developing countries. A cash transfer scheme may be universalistic if it is intended as a right for all the population, although perhaps based on citizenship and conditional or targeted if it is intended for achieving specific purpose or for particular section of the community based on prescribed eligibility criteria mostly employment. Cash transfers to farmers mainly deals with the farming community and aims to ease the liquidity constraints of the farmers in purchasing agricultural inputs or for any domestic purpose. Persistent cash transfers or income support will trickle the

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economic growth of poor and make them economically secure. Also, cash transfers would be less expensive, freedom-enhancing and allow individuals to prioritise needs for their families and to make strategic choices for themselves. The cash grants had been very successful in regenerating livelihoods (Brandsetter, 2004), building up assets, and to pay off debts, purchase seeds, sheep or goats, thereby enabling them to work (Standing, 2008). The income support of Rs 2000/- just before the crop season is supposed to ease the liquidity constraints the farmers face during the crop season. The income is intended to be used for purchase of agricultural inputs. The availability of easy money would enable the farmers to search for newer technology and to adopt them. Ragi is a traditional food crop of the dry land farmers of Tumkur district of Karnataka.The area under ragi in Karnataka has fallen from 8.41 lakh ha in 2008-09 to 6.71 lakh ha in 2013-14. Similarly the production has fallen from 13.94 lakh qtl in 2008-09 to 11.80 lakh quintals in 2013-14. This is a typical trend characteristic of the traditional crops/minor millets which is often christened as an inferior commodity. It is a hardy crop with low water requirement, and farmers use less of fertiliser and pesticides. The farmers use most of their resources on industrial crops or commercial crops like mango, coconut, sericulture, rice, maize, etc. However, with availability of liquid money the farmers may be tempted to dispense some portion for the traditional crops. These are mainly cultivated for meeting home consumption needs. Thus the allocation of land and other resources for crop cultivation is not guided by market price signals. Since 2014 Karnataka government has included the crop for distribution in public distribution system. This move has given boost to its production. The realisation of health benefits of crop by consumers has enabled it to realise higher price. Ragi comes under minor millets and is consumed by making chapati, ragi balls, ragi puttu, etc. The ragi-based breakfast cereals that include chocolate-filled cereals, millet muesli, ragi flakes and a masala ragi-oats meal, ragi cookies, ready-to-eat ragi dosa and ragi rava idli mixes, powdered drink 'Vitos' made of ragi, ragi pancakes, muffins, ragi malt, savige, hurihittu, nippattu, chakli, papad, pusti ragi laddu, millet soup sticks, bread, cute and sweet snacks that can be prepared in a bakery (Gupta, 2017). It is rich in protein (7.6 gm), fat (1.5 gm), carbohydrates (72.6 gm), Vitamin A (0.48 mg), Thiamine B1(0.33 mg), Ribboflavin B2 (0.11 mg), Niacin B3 (1.2 mg), Fibre (3.2 gm), Zinc (2.36 mg), Iron (4.14 mg). To tackle the essential problem of low yield per acre, the agriculture department has set up a consortium comprising ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) from Hyderabad, National Centre for Biological Sciences and the four agricultural universities of Karnataka state to work on genome based marker assisted breeding for better varieties of ragi, jola, tur, bengal gram and groundnut (Aji 2017).It is important to assess the impact of liquid money made available by way of PMKISAN. In the earlier studies, the impact of PMKISAN scheme was evaluated on the production, profitability and effiiency of an important traditional crop i.e., ragi crop. The present study was therefore taken up with following specific objectives: (1) To evaluate the utilisation pattern and impact of PM-KISAN

on technology adoption; and (2) To analyse the perception, participation and constraints of the scheme.

II

METHODOLOGY

Data

Multistage random sampling plan was followed to collect data. Karnataka state was purposively selected to study the effectiveness of PM-KISAN Yojana, as in the state only this scheme was operational. In many other states along with PM-KISAN, state specific investment support schemes are also in operation. Tumkur district was purposively selected as it is a dry region and majority of the farmers are small and marginal. Therefore, income support of Rs.6000 per annum per farm family plays an important role in such region. In the district, there are three agro climatic zones. Two blocks, namely Gubbi and Kunigal blocks representing two different climatic zones were randomly selected.Within each block, one hobli[1] was randomly selected and in each hobli two cluster of villages were randomly selected. In each cluster of village 30 farmers were randomly selected and interviewed. Thus the total sample size was 120 farmers which include both beneficiary and non-beneficiary farmers of PM-KISAN scheme. The primary data was collected using structured schedule. Besides, the data was also collected from various stakeholders involved in the implementation of the scheme like state department of agriculture, revenue department, etc.

III

ANALYTICAL TOOLS

Extent of Adoption (EA) of Technology:

The cash transfer helps the farmer in purchasing good quality inputs. The timely use of required inputs helps in the adoption of appropriate technology by farmers. The extent of adoption of technology was computed and the composite index was developed to compare the pattern of technology adopted by the beneficiary and non-beneficiary farmers of the scheme in the study area.

The actual level of adoption of technology by farmers was compared with recommended package of practices of University of Agricultural Sciences, Bengaluru**.** The farmers practiced varied levels of adoption of different technologies like use of high yielding varieties, seed treatment, balanced fertiliser use, plant protection measures**,** etc. The ratio of actual adoption of technology to recommended level of technology gives the extent of adoption of technology (Manaswi *et al.,* 2019, 2020)**.**

$$EA = \frac{\text{Actual adoption}}{\text{Recommended technology}} \text{ X } 100 \quad \text{.... (1)}$$

Development of Composite Index

The Principle Component Analysis (PCA) was used forcomputing weight for different technologies (Manaswi *et al*., 2020).

The function for deriving composite adoption index is given by equation 2,

$$S_i = W_1EA_1 + W_2EA_2 + ... + W_nEA_n \quad .... (2)$$

where, S_i is Composite adoption index score and EA_i's are the extent of adoption scores for individual component of technology.

This provides composite adoption index (of all components of technologies) for each cultivator. The composite adoption index lies between 0 and 1. Based on composite adoption score the farmers are classified as very low (0.15-0.30), low (0.30-0.45), medium (0.45-0.60), high (0.60-0.76) and very high (0.76-1.0) level of adopters.

Farm Business Analysis

The sample farmers were classified into two categories, i.e., beneficiary farmers and non- beneficiary farmers of PM-KISAN. The beneficiary farmers are supposed to have relatively higher level of technology adoption due to use ofquality inputs. The impact of the technology adoption was assessed in terms of enhancement in yield, income and improvement in efficiency. The various cost concepts were used to analyse the profitability of the ragi crop.

Cost Concepts

- Cost A_1= Wages of hired labour, cost of input, hired machinery charges, Imputed value of owned machine power, depreciation on implements and farm buildings, land revenue and interest on working capital.
- Cost B_1= Cost A_1 + interest on value of owned fixed capital (excluding land).
- Cost B_2= Cost B_1 + rental value of owned land.
- Cost C_1= Cost B_1 + imputed value of family labour.
- Cost C_2= Cost B_2 + imputed value of family labour.
- Cost C_3= Cost C_2 + 10 per cent of Cost C_2 accounting for managerial input

Farm Returns

- Farm business income = Gross income – Cost A_1
- Family labour income = Gross income – Cost B_2
- Net income over Cost C_1 = Gross income – Cost C_1
- Net income over Cost C_2 = Gross income – Cost C_2
- Net income over Cost C_3 = Gross income – Cost C_3

Data Envelopment Analysis Approach (DEA):

It is a non-parametric linear programming approach for evaluating the performance of ragi farmers. It calibrates the technical efficiency on the basis of estimated best-practice or efficient frontier or envelopment surface made up by a set of Pareto-efficient farmers (efficiency score=1). The efficiency of the firms is calculated in relation to this and gets the efficiency score between 0 and 1. Technical efficiency corresponding to constant returns to scale (CRS) assumption is known as Overall Technical Efficiency (OTE) which captures the efficiency due to both managerial and scale effects.

The output oriented CCR and BCC models, named after Charnes *et al.*, (1978) and Banker *et al.*, (1984) have been used to get OTE (under CRS assumption) and PTE (under variable returns to scale (VRS) assumption), respectively (Yogi et al., 2020).

Considering N number of ragi farmers, i=1,…, N and assuming that there are K inputs and M outputs with us. Let x_i and y_i denote the input and output vectors, respectively, for the i-th ragi farmer. The K*N input matrix X and the M*N output matrix Y, represent the data of all N ragi farmers.

To estimate the technical efficiency, the envelopment form of the linear programming problem using the duality is shown as equation 3.

$$\begin{aligned} &min_{\theta,\lambda}\ \theta, \\ &st-\ y_i + Y\lambda \geq\ 0, \\ &\theta x_i - X\lambda \geq 0, \\ &\lambda \geq 0, \end{aligned} \quad \ldots. (3)$$

where, θ is a scalar and λ is a N× 1 vector of constants. The value of θ is the efficiency score for the 'i'-th firm.

Resource Use Efficiency

The Cobb-Douglas production function was used to estimate efficiency of input use.

The Cobb-Douglas production function was estimated separately for beneficiaries (equation 4) and non-beneficiaries (equation 5) of PM-KISAN scheme.

$$\begin{aligned} ln\ Y_f = {} & lna_0 + a_1 lnS_f + a_2 lnM_f + a_3 lnP_f + a_4 lnO_f\ + a_5 lnC_f \\ & + lnI_f\ + a_7 lnE_f\ + a_8 lnB_f + U_f \end{aligned} \quad \ldots. (4)$$

$$\begin{aligned} ln\ Y_{nf} = {} & lnb_0 + b_1 lnS_{nf} + b_2 lnM_{nf} + b_3 lnP_{nf} + b_4 lnO_{nf}\ + b_5 lnC_{nf} \\ & + b_6 lnI_{nf} + b_7\ lnE_{nf}\ +\ b_8 lnB_{nf} + U_{nf} \end{aligned} \quad \ldots. (5)$$

where, S= Seeds; M = Machine labour; C= Plant protection chemicals; O= FYM; b= Bullock labour; I= Irrigation; C= Fertiliser; E=Human labour; U= random variable; the subscripts 'f'= beneficiaries of PM-KISAN; and 'nf'= non-beneficiaries of PM-KISAN.

Resource use efficiency in ragi production among the beneficiaries and non-beneficiaries of PM-KISAN scheme was estimated. In order to study the resource use efficiency of an input, the ratio of MVP of the input to its price was calculated using equation 6.

$$\frac{\mathrm{MVP_{xi}}}{\mathrm{P_{xi}}} = \frac{\mathrm{MPP_{xi}} * \mathrm{P_y}}{\mathrm{P_{xi}}} \quad \ldots. (6)$$

where P_y= Per Unit Output Price; Px=Per unit input price

If the ratio is less than unity, it indicated that the input is over-utilised. If MVP to price ratio is greater than unity, the resource in question is under-utilised and if the ratio is equal to one, it indicates that the input is optimally used.

Decomposition Analysis

To decompose the total difference in gross returns between the beneficiaries and non-beneficiaries of the PM-KISAN scheme into the constituent sources, Bisaliah (1977) output decomposition model was used. Taking the difference between the equations (3) and (4) and performing slight algebraic manipulation and rearrangement of some terms, the following decomposition model was arrived atand is presented in equation 7.

$$\begin{aligned} ln\{Y_f/Y_{nf}\} = \{ln(a_0/b_0)\} + \{(a_1 - b_1)\, lnS_{nf} + (a_2 - b_2)\, lnM_{nf} + (a_3 - b_3) \\ lnP_{nf} + (a_4 - b_4) lnO_{nf} + (a_5 - b_5)\, lnC_{nf} + (a_6 - b_6) \\ ln(a_7 - b_7)\, lnE_{nf} + ln\}\{a_1 ln(S_f/S_{nf}) + a_2 ln(M_f/M_{nf}) \\ + a_3 ln(P_f/P_{nf}) + ln(O_f/O_{nf}) + a_5 ln(C_f/C_{nf}) + a_6 ln(I_f/I_{nf}) \\ + a_7 ln(E_f/E_{nf}) + a_8 ln(B_f/B_{nf})\} + \{U_m - U_f\} \end{aligned} \quad \ldots. (7)$$

The left hand side of the equation (7) gives the total difference in gross returns expressed as percentage over non-beneficiary farmers. The natural logarithm of ratio of per hectare gross returns of beneficiaries to non-beneficiaries of PM-KISAN is a measure of percentage difference in gross returns of the two categories of farmers. The first bold bracketed term on the right hand side, the natural logarithm of constant terms, is the gap attributable to the neutral component of technology. It is a measure of neutral technological gap. The second bold bracketed term is the gap attributable to the non-neutral component of technology weighted by input use expenditure for non-beneficiaries of PM-KISAN. That is, it is a measure of non-neutral technological gap, after adjustment in the level of input use expenditure weighted by the slope coefficients of the production function fitted for the beneficiaries of PM-KISAN. Hence, it is the gap due to difference in the levels of input use between two categories of farmers after making due adjustment for production elasticities of different inputs. The last component is a random term which the model could not take into account.

IV

RESULTS

Socio Economic Characteristics of the Farmers

The primary data was collected from beneficiary and non-beneficiary of PMKISAN scheme of two blocks of Tumkur district of Karnataka to assess the utilisation pattern and adoption of technology for ragi crop. The information regarding the socio-economic characteristics of the sample farmers of beneficiaries and non-beneficiaries of PM-KISAN scheme is presented in Table 1. The sample farmers have been classified into five categories namely, marginal, small, semi-medium, medium and large farmers based on their landholdings. Marginal farmers accounted for the highest percentage (56.9 per cent) of the total sample farmers and are followed by small (31.9 per cent) and semi-medium (9.7 per cent) category of beneficiaries of the scheme. Whereas, in the case of non-beneficiaries of PMKISAN scheme, the marginal farmers were dominant group comprising 67 per cent of the total farmers. The other categories of the farmers with a considerable share were small (29.2 per cent) and semi-medium (4.2 per cent).

TABLE 1. SOCIO- ECONOMIC CHARACTERISTICS OF THE SAMPLE FARMERS

Particulars (1)	Beneficiary farmers (2)	Non-beneficiary farmers (3)	Total (4)
Land holding			
a. Marginal (up to 1 ha)	41(56.9)	32(66.7)	73(60.8)
b. Small (1-2 ha)	23(31.9)	14(29.2)	37(30.8)
c. Medium (2-4 ha)	7(9.7)	2(4.2)	9(7.5)
d. Large (4-10 ha)	1(1.4)	0	1(0.8)
Average land holding(acres)	2.95	2.34	2.64
Average age(years)	47.8	45.6	46.7
Educational status			
a. Illiterate	25(34.7)	15(31.3)	40(33.3)
b. Primary	20(27.8)	15(31.3)	35(29.2)
c. High school	17(23.6)	9(18.8)	26(21.7)
d. PUC	7(9.7)	7(14.6)	14(11.7)
e. College	3(4.2)	2(4.2)	5(4.2)
Caste composition			
a. Backward classes	40(55.6)	32(66.7)	72(60)
b. Scheduled Caste	21(29.2)	12(25)	33(27.5)
c. Scheduled tribes	1(1.4)	2(4.2)	3(2.5)
d. Others	10(13.9)	2(4.2)	12(10)
Who is getting the benefit			
a. Female	25(34.8)	6(12.5)	31(25.8)
b. Male	47(65.2)	42(87.5)	89(74.2)
Decision to invest			
a. Male	68(94.4)	45(93.7)	113(94.2)
b. Female	4(5.6)	3(6.3)	7(5.8)
Number of family members			
a. Adult male	1.25	1.33	
b. Adult Female	1.2	1.3	
c. Children	1.992	1.80	

Note: Figures in parentheses indicate percentage to the total.

The average age of beneficiary farmers was found to be 47.8 years while it is 45.6 years in case of non beneficiary farmers. Out of all the beneficiary farmers under study, it was found that around 35 per cent of them are illiterate while 28 per cent of the farmers have education up to primary level followed by high school (24 per cent), PUC (10 per cent) and college (4.2 per cent), respectively. In case of non-beneficiaries of the PM-KISAN scheme, it was found that 31 per cent of the farmers are illiterate and 31 per cent per cent of them were found to be educated up to primary level followed by high school (19 per cent), PUC (15 per cent) and college (4.2 per cent). In terms of caste composition, the majority of the beneficiaries and non-beneficiaries belong to backward classes (56 and 67 per cent, respectively), followed by scheduled caste and other caste.

Farmers registered and received few or all installments are considered as beneficiaries of the scheme. While farmers who are eligible but not registered under the scheme, registered but not received any installment and those not eligible under the scheme (exclusion category/ tenant farmers/ Agricultural Labourers) are considered as non-beneficiaries of the scheme. Of the total sample size of 120 farmers, 72 farmers registered and received few or all installments and are considered as beneficiaries while remaining 48 farmers are considered as non-beneficiaries of the scheme.

Utilisation Pattern of PM-KISAN Beneficiaries

The utilisation pattern of PM-KISAN beneficiaries is given in Table 2. It is observed that 64.6 per cent of those who received the first instalment spent it on agriculture. It was observed that farmers who spent first instalment on agriculture activities, spent mostly for the purpose of purchase of inputs (46.3 per cent), payment of wages (40.9 per cent), feed and fodder for cattle (11.8 per cent) and other expenditure (1.1 per cent).

TABLE 2. UTILISATION PATTERN OF PM-KISAN BENEFICIARIES

	Agricultural purpose (per cent)					Non-Agri purpose (per cent)
Instalments	Purchase of inputs	Payment of wages	Feed and fodder for dairy animals	Other expenditure	Total	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1st	46.3	40.9	11.8	1.1	64.6	35.4
2nd	20.5	50	14.7	14.7	51.1	48.9
3rd	11.1	53.3	31.1	4.4	39.5	60.5
4th	33.3	27.0	36.3	3.3	54.1	45.9

It was observed that the majority of the farmers who received second (August-November) and third (December-March) instalments spent it on non-agricultural activities due to disbursal of amount in non-cropping season. Since, the study area is rain fed region and only one crop inayear is taken up by majority of the farmers, so benefit received in off-season find likely to beused on non-agricultural activities. Spending on different activities depends on the time of receiving the benefit. If the benefit is received during the sowing period, the amount would be mostly used for the

purpose of ploughing, purchase of inputs like seeds, fertilisers. If the benefit isreceived late or after sowing is done, it would be used for carrying out intercultural operations and payment of wages. Hence utilisation of amount on different activities depends on the timing of disbursement of installment amount and stage of crop or cropping period. The expenditure on non-agricultural uses are also for socially desirable purposes like education of children, health, consumption, meeting old debt, etc.

Adoption of Ragi Production Technology

Table 3 reveals the adoption patternof recommended package of practices of ragi by the sample farmers. Overall the package of practices like ploughing (86.0 per cent), seed rate (81.0 per cent), inter-cultural practices (69.6 per cent) and fertilisers (68.3 per cent) were adopted by a large proportion of farmers. The package of practices like ploughing (86.3 per cent), seed rate (84.1 per cent), fertilisers (72.7 per cent)and sowing time (72.7 per cent) were adopted by more than 70 per cent ofthe beneficiary farmers. Some of theotherpractices like FYM, intercultural practices, spacing and plant protection etc., were adopted by fairly good number of beneficiaries.

TABLE 3. ADOPTION OF RAGI PRODUCTION TECHNOLOGIES BY BENEFICIARIES AND NON-BENEFICIARIES OF PM-KISAN SCHEME

Sl. No.	Ragi production technology	Extent of adoption (n=79)					
		Beneficiaries		Non-beneficiaries		Total	
		F	Per cent	F	Per cent	F	Per cent
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1)	Soil testing	8	18.2	7	20.0	15	18.9
2)	Ploughing	38	86.3	30	85.7	68	86.0
3)	Variety	20	45.5	13	37.1	33	41.8
4)	Seed rate	37	84.1	27	77.1	64	81.0
5)	Seed treatment	16	36.4	12	34.3	28	35.4
6)	Spacing	28	63.6	22	62.8	50	63.3
7)	Time of Sowing	32	72.7	21	60.0	53	67.0
8)	Inter-cultural	30	68.2	25	71.4	55	69.6
9)	FYM	30	68.2	19	54.2	49	62.0
10)	Fertilisers	32	72.7	22	62.9	54	68.3
11)	Weed management	25	56.8	18	51.4	43	54.4
12)	Plant protection	27	61.4	21	60.0	48	60.8
	Average	29	65.9	22	62.8	51	64.5

Among the non-beneficiaries of the scheme, the cultivation practices like ploughing (85.7 per cent), seed rate (77.1 per cent) and inter cultural practices (71.4 per cent) were adopted by large proportion of farmers. The package of practices like FYM, plant protection practices, time of sowing and spacing were adopted by around 50 percent of the non-beneficiary farmers. It was found that soil testing (18.2 per cent) and seed treatment (20 per cent) were adopted by lesser proportion of farmers among both beneficiary and non-beneficiary farmers. To understand the variation in technology adoption between beneficiaries and non-beneficiaries the adoption index was constructed. The different components of package of practices have differing rate of importance in overall crop production technology.Principal component analysis

approach was used to calculate the weights for different production technologies of ragi crop adopted by beneficiaries and non-beneficiaries of the PM-KISAN scheme.

Principal component analysis is an objective measure which provides relatively higher weights to the technologies which are highly contributing to the gap in adoption level of the both the categories of the farmers under study.

Among the different ragi production technologies adopted by the farmers, variety and seed treatment both obtained the maximum weight of 0.111 (Table 4). Some of the other practices which received higher weights were inter-cultural operations (0.108), soil testing (0.089) and time of sowing (0.088), etc. Weed management (0.034) obtained the lowest weightage and was closely followed by spacing (0.061) and fertilisers (0.073).

TABLE 4. WEIGHTS FOR RAGI PRODUCTION TECHNOLOGY DERIVED USING PRINCIPAL COMPONENT ANALYSIS

Production technology (1)	Weights (2)	Production technology (1)	Weights (2)
Variety	0.111	Ploughing	0.083
Seed Treatment	0.111	Plant protection	0.081
Inter-cultivation	0.108	FYM	0.074
Soil Testing	0.089	Fertilisers	0.073
Time of sowing	0.088	Spacing	0.061
Seed rate	0.087	Weed management	0.034

Table 5 depicts the level of adoption of ragi production technology by the farmers.The farmers were categorised into five groups based on technology adoption scores viz. very low (0.15-0.30), low (0.30-0.45), medium (0.45-0.60), high (0.60-0.75) and very high (>0.75). Greater proportion of non-beneficiary farmers (25.7 per cent) belonged to very low category compared to beneficiary farmers (20.5 per cent). The improvement in adoption of technology as revealed by higher proportion of farmers with medium and above category of adoption was observed for beneficiary farmers (52.3 per cent) whereas the same was 45.6 per cent for non-beneficiaries.

TABLE 5. LEVEL OF ADOPTION OF RAGI FARMERS ACCORDING TO COMPOSITE ADOPTION INDEX

			Level of adoption					
			Beneficiaries		Non-beneficiaries		Total (n=79)	
Sl. No (1)	Category (2)	Score range (3)	No. (4)	Per cent (5)	No. (6)	Per cent (7)	No. (8)	Per cent (9)
1)	Very low	0.15- 0.30	9	20.5	9	25.7	18	22.7
2)	Low	0.30-0.45	12	27.3	10	28.5	22	27.8
3)	Medium	0.45-0.60	12	27.3	7	20.0	19	24.0
4)	High	0.60-0.75	9	20.5	6	17.1	15	18.9
5)	Very high	>0.75	2	4.5	3	8.5	5	6.3
	Total		44	100.0	35	100	79	100.0

Economics of Ragi Production

Table 6 discusses the contribution of various costs to the total cost of cultivation of ragi by the beneficiaries and non-beneficiaries of the PM-KISAN scheme. It

is observed that human labour charges, FYM and bullock labour wages accounted for highest share in the cultivation of ragi which accounts for 27.2 per cent, 22.9 per cent and 15.0 per cent, respectivelyin the case of beneficiary farmers whereas it is 27.9 per cent, 22.2 per cent and 18.1 per cent, respectively in the case of non-beneficiary farmers.The beneficiary farmers incurred 6 per cent higher expenses towards ragi cultivation.

TABLE 6. INPUT COSTS IN CULTIVATION OF RAGI FOR BENEFICIARIES AND NON-BENEFICIARIES OF PM-KISAN SCHEME

(*Rs. /acre*)

Particulars	Beneficiary	Per cent	Non-Beneficiary	Per cent
(1)	(2)	(3)	(4)	(5)
Human labour (man-days)	2632	27.2	2544	27.9
Bullock labour (Pair -days)	1448	15.0	1652	18.1
Machine labour***	1416	14.6	1400	15.3
Seeds**	135	1.4	140	1.5
FYM*	2218	22.9	1850	22.2
Fertilisers**	1155	11.9	952	10.4
Plant protection chemicals	118	1.2	110	1.2
Irrigation charges	113	1.2	96	1.1
Miscellaneous	213	2.2	172	1.9
Interest on working capital @7 per cent annum	237	2.4	216	2.4
Total input cost	9683	100.0	9132	100.0

Note: *, **, *** refers to 1, 5,10 per cent, level of significance.

The Table 7 shows the farm business analysis of ragi cultivation by the beneficiaries and non-beneficiaries of the PMKISAN scheme. Different cost concepts of farm management were used and compared between beneficiaries and non-beneficiaries. The beneficiary farmers recorded 11.4 per cent higher yield compared to

TABLE 7. COST AND RETURNS IN RAGI CULTIVATION BY BENEFICIARIES AND NON-BENEFICIARIES OF PM-KISAN

(*Rs. /acre*)

Particulars	Beneficiary	Non-beneficiary
(1)	(2)	(3)
Yield (quintal/acre)**	6.8	6.1
Price (Rs/quintal)	2250	2250
Byproduct	4993	4788
Gross returns*	20334	18513
Input costs	9683	9132
Cost A	9041	8549
Cost B_1	9253	8763
Cost B_2	11253	10763
Cost C_1	10299	9763
Cost C_2	12299	11763
Cost C_3	13528	12940
Farm business income	11293	9964
Family labour income	9081	7750
Net returns over C_1**	10036	8750
Net returns over C_2**	8036	6750
Net returns over C_3***	6806	5573
B-C ratio	2.09	2.02

Note: *, **, *** indicate 1,5, 10 per cent, level of significance.

non-beneficiaries. The beneficaries realised 4 per cent higher yield of by-products too. The higher yield was acompanied with higher input exenses bybeneficiary farmers (Rs.9,683/-) which is 6.03 per cent more than that of non-beneficiary farmers. The gross returns and B-C ratio for beneficiary farmers is Rs.20,334/- and 2.09 respectively, whereas it is Rs.18,513/- and 2.02 in case of non-beneficiary farmers. Thus, it is revealed that the input costs, gross returns and B-C ratio was found to be higher for beneficiary farmers compared to non-beneficiary farmers.

Resource Use Efficiency

To examine the input utilisation pattern of both the beneficiaries and non-beneficiaries of PM-KISAN, resource use efficiency has been calculated. The elasticity of production i.e., coefficients of Cobb-Douglas production function were estimated. The log-linear estimates of the Cobb- Douglas production of ragi for beneficiaries and non-beneficiaries are presented in Table 8. It was observed that in case of both beneficiary and non- beneficiary farmers, the expenditure on inputs like human labour (man-days), seeds, FYM and fertilisers were found to be significantly influencing returns.

TABLE 8. ESTIMATES OF COBB-DOUGLASS PRODUCTION FUNCTION OF RAGI FOR BENEFICIARIES AND NON-BENEFICIARIES OF PM KISAN

(*Rs. /acre*)

	Beneficiaries of PM-KISAN			Non-Beneficiaries of PM-KISAN		
Parameter	Coefficients	Std Error	P>|t|	Coefficients	Std Error	P>|t|
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Human Labour	0.103**	0.049	0.045	0.217**	0.893	0.035
Bullock Labour	0.027	0.022	0.225	0.004	0.037	0.904
Machine Labour	0.001	0.024	0.966	0.012	0.077	0.880
Seeds	0.130**	0.056	0.026	0.256**	0.101	0.016
FYM	0.092**	0.043	0.042	0.117*	0.061	0.064
Fertilisers	0.141**	0.059	0.020	0.147**	0.070	0.045
Plant protection Chemicals	0.000	0.002	0.873	-0.001	0.002	0.446
Irrigation	0.002	0.001	0.186	-0.001	0.001	0.201
Intercept	6.572***	0.448	0.000	4.904***	0.893	0.000
R- squared	0.839			0.796		
Adjusted R- squared	0.802			0.739		
Prob> F	0.001			0.001		

Note: *, ** and ***indicates significant at 10, 5 and 1 per cent level, respectively

Resource use efficiency can be defined as the ratio of marginal value product to the price of each input used in the production process. The variables which were found to be significant in the estimated Cobb- Douglass production function was analysed for their efficiency.

Elastcity, marginal value product and marginal factor cost of the inputs of ragi production for beneficiary and non-beneficiary farmers are presented in Table 9. Comparative analysis between the non-beneficiaries and beneficiary farmers show that seeds, labour and FYM are efficiently used by the beneficiary farmers. It was observed

that both beneficiary and non-beneficiary farmers have under-utilised the resources and increase in the use of these resources will increase the returns.

TABLE 9. RESOURCE USE EFFICIENCY IN RAGI PRODUCTION BY BENEFICIARIES AND NON-BENEFICIARIES OF PM KISAN

	Beneficiaries				Non-Beneficiaries			
Inputs	Elasticity of production	Marginal value product	Marginal factor cost	Resource use efficiency	Elasticity of production	Marginal value product	Marginal factor cost	Resource use efficiency
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Human labour	0.10	1.04	1	1.04	0.28	2.06	1	2.06
Bullock labour	-	-	-	-	-	-	-	-
Machine labour	-	-	-	-	-	-	-	-
Seed	0.13	18.50	1	18.50	0.26	35.48	1	35.48
FYM	0.09	0.96	1	0.96	0.12	1.27	1	1.27
Fertilisers	0.14	2.13	1	2.13	0.15	2.29	1	2.29
PPC	-	-	-	-	-	-	-	-
Irrigation	-	-	-	-	-	-	-	-

Decomposition of Gross Returns

The difference in the net returns obtained in cultivation of ragi between beneficiaries and non-beneficiaries of PM-KISAN scheme was segregated into their constituent sources, i.e., technological change and difference in the input expenditure utilising the model suggested by Bisaliah (1977). The results of the decomposition model revealed that the total observed difference in the gross returns in the cultivation practices adopted by both the categories of the farmers is 9.07 per cent in ragi production (Table 10). This increase in the gross returns of the beneficiaries of PM-KISAN was attributed to the utilisation of cash transfer for the purchase of timely and high-quality inputs. Among the constituents of the sources of difference in gross returns, the increase in gross returns due to the difference in input use expenditure was 4.07 per cent in ragi production.

The expenditure on inputs was positively contributing to the gap in gross returns between beneficiaries and non-beneficiaries (Table 10). The input expenditure on fertilisers, FYM and seeds was found to be positively influencing the difference in gross returns to the extent of 1.70, 1.22 and 0.79 per cent, respectively in ragi production. Out of all the constituent sources contributing to the change in the returns of the farmers, both production technology and input use expenditure contributed to increase in the returns of beneficiaries.

The farmers though eligible under the scheme did not register under the scheme due to various reasons are the samepresented in the Table 11. Lack of land ownership or land titles in their name, is the main reason for farmers not registering under the scheme, which accounts for about 42.6 percent. Other problems like limited period for registration (25.4 per cent), lack of awareness (15.6 per cent), lack of clarity about the

TABLE 10. DECOMPOSITION OF GROSS RETURNS OBTAINED AMONG BENEFICIARIES AND NON-BENEFICIARIES OF PM-KISAN

Sources of productivity difference (1)	Ragi (per cent contribution) (2)
Total observed difference in returns	9.07
A. Due to difference in production technology	4.61
B. Due to difference in input expenditure	4.07
a) Human labour	0.26
b) Bullock labour	0.09
c) Machine labour	-0.01
d) Seed	0.79
e) FYM	1.22
f) Fertilisers	1.70
g) PPC	0.0002
h) Irrigation	0.02
Total estimated difference in returns	8.68

TABLE 11. REASONS FOR NOT REGISTERING UNDER THE SCHEME BY FARMERS

Particulars (1)	Per cent (2)
Land ownership problems	42.6
Lack of awareness	15.6
Lack of clarity about eligibility criteria	10.2
Others in family have already become member	25.5
Lack of trust about the government scheme	13.4
Quantum of money was small	10.3
Limited time period for registration	25.4

eligibility (10.2 per cent) were also the reasons for not registering in the scheme by farmers. Few farmers did not register under the scheme because already other members in the family have registered under the scheme and a fewthought that the quantum of support was very small or found not necessary. Lack of trust with the government schemes due to past experience, visiting to panchayat office formore number oftimes and other problems prevented farmers from registering under the scheme.

V

CONCLUSION

The PMKISAN scheme has been implemented from 1st December 2018 with income support of Rs 6000/- per farm family paid in three intallments of Rs 2000/- each in the begining of crop season. The support is supposed to ease the liquidity constraints farmers face during the crop season. The income is intended to be used for purchase of agricultural inputs. The availability of easy money would enable the farmers to search for newer technology and to adopt them. The ragi farmers of Karnataka are using higher amount for purchase of inputs. The resultant effect is increase in yield and income. The B:C ratio is higher among the beneficiary famer as compared to non-beneficiary farmers. The presence of money has enabled the farmers to be technically more efficient as compared to non-beneficiary farmers. The benefiary

farmers are realising 9.07 per cent higher gross return compared to non-beneficary farmers. The beneficairies have moved up the technical efficiency ladder with greater proportion of farmers being observed with medium and above efficiency as compared to non-beneficiaries. It is therefore suggested that the scheme needs to be continued in future to boost agricultural productivity of traditional crops/minor millets like ragi.The dispersal of amount should be timely, i.e., just before sowing season to ensure the efficient use of PMKISAN scheme and in realising maximum gains.There is a need to popularise the scheme through agricultural extension machinery to overcome the misconceptions of the farmers.

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NOTE

1) Hobli is a cluster of adjoining villages administered together for tax and land tenure purposes in the states of Karnataka and Andhra Pradesh. Several hobli together form taluk.

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