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*RESEARCH ARTICLE*

# INNOVATIVE FARMING PRACTICES AND THEIR EFFECTS ON THE ECONOMIC VIABILITY OF CROPSOF MALWA REGION

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## *Abstract*

A field experiment was conducted At All India Coordinated Research Project on Integrated Farming System, College of Agriculture, Indore during the kharif and rabi season 2016-17and 2017-18 with the objective to find out the effect of methods of tillage, nutrient management and mulch practices on growth and yield of different crops and cropping system and their effect on economic viability as well as find out the best treatment combination for higher yield and profitability. Experiment was laid out in split plot design with three replication and total thirty two treatment combinations was done. On the basis of result obtained from the experiment it is concluded that SEY (grain)4920kgha$^{-1}$, gross return ( 201831), net return ( 141696) and benefit cost ratio (6.70), gave significantly higher values in CS2 (soybean +maize-wheat) of soybean in kharif and wheat in rabi. Among the different treatments T1(minimum tillage), F2 the application of 75% RDF + 25% vermi-compost),M2(with mulch).



## Introduction:-

Soybean is one of the pre-eminent crop in providing cheap and inexpensive protein (40%) and oil (20%) which determines the economic worth of the crop on the globe .Wheat(Triticum aestivum L.) is the main cereal crop and mainly grown in rabiseason in India. Small-scale farmers have been bearing mixed cropping for various reasons which include increased monetary returns, insurance against crop failure and reduction of pests due to biological diversity within the system). The yield advantage obtained in intercropping over sole cropping of two crops which can be adopted to provide more the combined intercrops yield than combined sole crop yield. The collective production from the component crops may be greater in intercropping than in sole cropping from a unit land area because of yield advantages occurred as a result of complementary use of resources by component crops as a result, growing two or more crops together is the increase in productivity per unit area.

## Materials and Methods:-

The present investigation was carried out during kharif and rabi season 2016-17 and 2017-18 under All India Co-ordinated Research Project All India Coordinated Research Project on Integrated Farming System, RVSKVV, College of Agriculture; Indore(M.P.). The rainfall in the region is mostly inadequate and erratic. Late commencement, early withdrawal of monsoon and occurrence of two to three dry spells during the rainy season are the common features. The annual average rainfall is 964 mm.The topography of the field was uniform with proper drainage. The soil of the experimental field was under medium black clay soil (Vertisols) (13.25% sand, 30.75% silt

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and 56.00% clay), neutral to alkaline in reaction (pH 7.5). The soil was low in organic carbon (0.40%), available nitrogen (186.7kg/ha), medium in available phosphorus (6.78kg/ha) and available potassium (562 kg/ha), and electrical conductivity 0.23m mhos $cm^{-1}$.The experiment was conducted Split plot design with 3 replications and 32 treatments (Table – 3). The treatments includes 5 crops i.e Soybean (JS95 60) as sole crop and Maize(KMH-25K45)Sorghum (CSH-16)their intercropping systems in row ratio 4:2 Arhar(TGT-501)+Sorghum (F)(MPChari )in 1:1 row ratio in kharifand wheat(GW-366), Gram(JAKI-9218).The planting geometry was Soybean (30x5) as sole crop andMaize( 30x50)Sorghum (30x20) their intercropping systems in two row ratio 4:2 Arhar( 30x15)+Sorghum (F)(30x20 ).Wheat(22.5 R x R), Gram(30x10).The seed rate of soybean Maize Sorghum Arhar Sorghum Wheat and Gram (F) was100,25,15,15,30,120,100. kg/ha; respectively. All the kharif and rabicrops were sown in the first week of July 2017and first week of November respectively. The nutrients were applied @ 20 kg N, 60 kg $P_2O_5$ and 20 kg $K_2O$/haas basal through urea, SSP and muriate of potash. All recommended practices were followed during crop-growing season.

## Results and Discussion:-

According to the result maximum SEY was found under $CS_2$ (Soybean+ Maize-Wheat) as compared to sole Soybean-Wheat cropping system. It may be due to Maize is $C_4$ species which have higher production efficiency than Soybean $C_3$ species and higher contribution of yield building material in kharif and higher Wheat production due to higher nitrogen fixation by Soybean in intercropping system and also due to compensatory growth, or a recovery process, known as the 'competition-recovery production principle' Similar result were reported by Khatri et.al.(2014), Khan et al.(2009), Patra et al (1986), and Zhang et al (2015). Net returns, gross returns and B:C ratio has been found higher in $T_1$ (minimum tillage), mainly due to lower cost of production compared to that in conventional method. The study has observed that $T_1$ (minimum tillage), has potential to provide additional income to farmers and help in conservation of scarce resources. These observation are supported by the finding of Tripathi et al. (2016), Pramanik et al. (2014).Under different cropping system maximum profitability was recorded in $CS_2$ (Soybean + Maize-Wheat) cropping system. This was due to higher production of Maize and Wheat and higher SEY. This result is agreement to Khatri et al. (2014), Ghosh et al. (2005). $F_2$ treatment (application of 75% RDF + 25% Vermi – compost) gave higher gross return, net return and BC ratio it is due to higher grain yield and equivalent yield. Similar result reported by Nandanidevi et al. (2013), Samsul et al. (2012).Crop residue $M_2$ treatment(with mulch) gave significantly higher gross return, net return, and BC ratio due to favorable effect of mulch in soil fertility through nutrient recycling which leads to the higher production. These results are similar to the results of Choudhary et al. (2014).

**Summary:**

The SEY, net returns, gross returns, B:C ratio was recorded maximum under $T_1$ (minimum tillage) in $CS_2$ (Soybean + Maize-Wheat) cropping systems. The $F_2$ treatment (application of 75%RDF +25% vermicompost) gave maximum SEY, net returns, gross returns, B:C ratio than $F_1$( 100 % RDF) as well as $M_2$ (with mulch) gave the best result as compared to $M_1$ (without mulch).

**Abbreviations:**

kg/ha: Kilogram per hectare,SEY: soybean equivalent yield, CS: cropping system, T: tillage, M: mulch, F: fertilizer

**Effect of tillage, INM and mulch on SEY, gross returns, net returns, B:C ratio of different treatments:**

| S. No. | Treatments | SEY | GROSS RETURN | NET RETURN | B:C RATIO |
|---|---|---|---|---|---|
| **1** | **Tillage** | | | | |
| I | Minimum($T_1$) | 3963 | 166852 | 109497 | 5.87 |
| II | Conventional($T_2$) | 3673 | 152136 | 92731 | 5.31 |
| | **SEm±** | **4.85** | **313.8** | **307.05** | **0.0161** |
| | **CD (at 5%)** | **13.025** | **842.27** | **824.95** | **0.046** |
| **2** | **Cropping system** | | | | |
| I | Soybean-sole-Wheat($CS_1$) | 4247 | 174027 | 105153 | 5.5 |
| II | Soybean+Maize-Wheat ($CS_2$) | 4920 | 201831 | 141696 | 6.70 |
| III | Soybean+Sorghum-Sorghum($CS_3$) | 2557 | 135830 | 84380 | 5.30 |
| IV | Arhar+Fodder-Wheat($CS_4$) | 3548 | 137227 | 77729 | 4.53 |
| | **SEm±** | **11.055** | **283.02** | **281.23** | **0.0152** |

| | | | | | |
|---|---|---|---|---|---|
| | **CD (at 5%)** | **29.7** | **760.34** | **755.55** | **0.0435** |
| **3.** | **INM** | | | | |
| I | 100% RDF($F_1$) | 3772 | 156060 | 104039 | 5.325 |
| II | 75%RDF+ 25% vermicompost ($F_2$) | 3854 | 162898 | 100189 | 5.65 |
| | **SEm±** | **31.47** | **82.07** | **106.22** | **0.0115** |
| | **CD (at 5%)** | **84.54** | **220.48** | **285.34** | **0.052** |
| **4.** | **Mulch** | | | | |
| I | No Mulch($M_1$) | 3792 | 156432 | 99066 | 5.42 |
| II | Mulch ($M_2$) | 3844 | 162526 | 105161 | 5.72 |
| | **SEm±** | **31.47** | **82.07** | **106.22** | **0.0115** |
| | **CD (at 5%)** | **84.54** | **220.48** | **285.34** | **0.07** |

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