

## RESEARCH NOTE

## System Productivity and Economic Returns of Different Cropping Systems under Malwa Conditions of M.P.

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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 2016-17 and 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 the sole crop Soybean i.e. CS1 (soybean -wheat) namely gave significantly higher values of all plant height, seed yield (kg/ha) in kharif and CS2 (soybean +maize-wheat) in rabi and net monetary returns was found highest in CS2 (soybean + maize-wheat). Among the different treatments T1 (minimum tillage), F2 ( the application of 75% RDF + 25% vermi-compost), M2(with mulch).

**Key words:** Soybean; Wheat; Growth attributes; Cropping system; Net monetary returns; Growth parameter;

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 .Majority of soybean area (about 52 %) in India comes under Madhya Pradesh, of this 95-98% area is located in Malwa region of the state (SOPA 2017).In India soybean is grown in 10.5 million ha with total production of 11.5 million tonnes. In Madhya Pradesh it is grown in 6.38 million ha with total production of 5.37 million tons, and productivity 784 kg/ha<sup>-1</sup>. (SOPA 2017). Wheat (*Triticum aestivum* L.) is the main cereal crop and mainly grown in Rabi season in India. Indian wheat is largely a medium protein, soft/medium hard and white bread wheat. Higher area coverage is reported from Madhya Pradesh in recent years. India ranks in third in the world in respect of production. The production of wheat is 97.11 million tons from 30.6 million ha (Anonymous, 2017).

### METHODOLOGY

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.). Indore is situated in Malwa Plateau region in the western part of the state of Madhya Pradesh at an altitude of 555.5 meters above mean sea level (MSL). It is located at latitude 22.43°N and longitude of 75.66° E. It has subtropical climate having temperature range of 21°C to 45°C and 6°C to 31°C in summer and winter seasons, respectively. 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 and 56.00% clay), neutral to alkaline in reaction (pH 7.5). The soil was low in organic carbon (0.40%), available nitrogen (186.7 kg/ha), medium in available phosphorus (6.78 kg/ha) and available potassium (562 kg/ha), and electrical conductivity 0.23m

mos cm<sup>-1</sup>. 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 *kharif* and wheat (GW-366), Gram(JAKI-9218). The planting geometry was Soybean (30x5) as sole crop and Maize( 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 (F) was 100, 25,15,15,30,120,100. kg/ha; respectively. All the *kharif* and *rabi* crops were sown in the first week of July 2017and first week of November

respectively. The nutrients were applied @ 20 kg N, 60 kg P<sub>2</sub>O<sub>5</sub> and 20 kg K<sub>2</sub>O/ha as basal through urea, SSP and muriate of potash. All recommended practices were followed during crop-growing season.

The data recorded on different observations were tabulated and analysed statistically by using the techniques of analysis of variance (Fisher, 1958).

**RESULTS AND DISCUSSION**

The sole crop soybean of CS1(soybean-wheat) in *kharif* and wheat of CS2 (soybean + maize-wheat) in *rabi* produced significantly higher values of plant height and seed yield attributes over various cropping systems.Similar findings were also recorded by Tetio – Kaglo (1915), and Khatri et al. (2014). The sole crop

**Table 1. Effect of different tillage, cropping system, INM and mulch on mean plant height (cm) of Soybean and Wheat**

| Treatments                      | Soybean |        |        |            | Wheat |        |        |            |
|---------------------------------|---------|--------|--------|------------|-------|--------|--------|------------|
|                                 | 20 DAS  | 40 DAS | 60 DAS | At Harvest | 20DAS | 40 DAS | 60 DAS | At Harvest |
| <i>Tillage</i>                  |         |        |        |            |       |        |        |            |
| Minimum (T1)                    | 14.8    | 25.2   | 43.9   | 45.6       | 4.29  | 21.95  | 70.97  | 81.22      |
| Conventional(T2)                | 14.6    | 25.1   | 43.5   | 44.8       | 4.27  | 21.53  | 70.71  | 80.99      |
| <i>Cropping system</i>          |         |        |        |            |       |        |        |            |
| Soybean sole Wheat CS1)         | 15.4    | 26.0   | 44.7   | 45.2       | 4.45  | 21.8   | 70.72  | 81.02      |
| Soybean +Maize- Wheat (CS2)     | 14.1    | 25.9   | 42.9   | 44.8       | 4.51  | 21.86  | 70.78  | 81.08      |
| Soybean+Sorghum- Gram (CS3)     | 14.2    | 25.4   | 43.5   | 44.7       | -     | -      | -      | -          |
| Arhar+ Fodder – Wheat (CS4)     | -       | -      | -      | -          | 4.19  | 21.54  | 70.46  | 80.76      |
| <i>INM</i>                      |         |        |        |            |       |        |        |            |
| 100% RDF(F1)                    | 14.1    | 25.5   | 40.7   | 44.9       | 4.25  | 21.49  | 69.53  | 80.82      |
| 75% RDF+ 25% vermi-compost (F2) | 14.4    | 26.0   | 41.9   | 45.6       | 4.31  | 21.98  | 72.16  | 81.39      |
| <i>Mulch</i>                    |         |        |        |            |       |        |        |            |
| No Mulch(M1)                    | 13.5    | 25.3   | 40.8   | 44.6       | 4.25  | 21.27  | 69.99  | 80.59      |
| Mulch (M2)                      | 14.0    | 25.5   | 41.7   | 45.2       | 4.30  | 22.20  | 71.69  | 81.62      |

**Table 2. Effect of different tillage, cropping system, INM and mulch on mean yield (kg/ha-1) of soybean and wheat**

| Treatments                      | Soybean | Wheat |
|---------------------------------|---------|-------|
| <i>Tillage</i>                  |         |       |
| Minimum (T1)                    | 1620    | 4909  |
| Conventional(T2)                | 1252    | 4799  |
| <i>Cropping system</i>          |         |       |
| Soybean sole Wheat CS1)         | 1697    | 5024  |
| Soybean +Maize- Wheat (CS2)     | 1296    | 5732  |
| Soybean+Sorghum- Gram (CS3)     | 1315    |       |
| Arhar+ Fodder – Wheat (CS4)     |         | 4868  |
| <i>INM</i>                      |         |       |
| 100% RDF(F1)                    | 2451    | 4155  |
| 75% RDF+ 25% vermi-compost (F2) | 2693    | 4546  |
| <i>Mulch</i>                    |         |       |
| No Mulch(M1)                    | 2058    | 4540  |
| Mulch (M2)                      | 2018    | 4665  |

**Table 3. Effect of tillage, cropping systems, INM and mulch on net return (Rs ha<sup>-1</sup>) of different treatment**

| Treatments                     | Net returns   |             |
|--------------------------------|---------------|-------------|
|                                | <i>Kharif</i> | <i>Rabi</i> |
| <i>Tillage</i>                 |               |             |
| Minimum(T1)                    | 52298         | 57199       |
| <i>Cropping system</i>         |               |             |
| Soybean+Maize-wheat (CS2)      | 63183         | 78513       |
| <i>INM</i>                     |               |             |
| 75%RDF+ 25% vermi-compost (F2) | 46744         | 53445       |
| <i>Mulch</i>                   |               |             |
| Mulch (M2)                     | 47467         | 57694       |

of soybean produced significantly higher plant height and yield than their intercropping systems (Table 1 and 2) as also was founded by Bhadoria, et al (1992). Difference in plant height and yield were obtained under

sole crops owing to better micro-climatic due to less plant competition and in wheat due to higher nitrogen fixation by soybean due to intercropping system. All the intercropping was found to be most profitable as compared to their sole crops. The highest net monetary returns (Rs.63183, Rs.78513) (Table 3) was found in CS2 (Soybean + maize(4:2)-wheat) over rest of the cropping system in *kharif* and *rabi* season.

T1 (minimum tillage) gave higher value of plant height, seed yield, and net returns than conventional tillage due to efficient utilization of nutrient and moisture and yield. These results were in confirmation with finding of *Ali et al. (2015)*.

Plant height, seed yield, and net returns were found highest by F2 (the application of 75% RDF + 25% vermi-compost). The parameter were progressively increased up to maturity, this might be due to conjunctive use of inorganic fertilizer with organic manure which had resulted in higher concentration of nutrients in the

plant cell, by which rapid cell division and cell elongation had been occurred thus increased yield was found. Similarly found as *Shrivane et al. (1999)*.

These growth parameters was recorded maximum under M2 (with mulch) treatment compare to M1 (without mulching) at successive stages of crop growth. Mulching helps in good crop growth, high moisture regime, better utilization of the nutrient, proper development of roots which results in enhanced crop growth and also yield increases which also increases net return. Similar findings were also *Singh et al. (2002)*.

## CONCLUSION

On the basis of foregoing results, it can be concluded that the soybean based intercropping followed by wheat cropping system were found to be more productive with minimum tillage, 75% RDF, mulching and remunerative, for achieving the higher productivity and profitability from unit land area under cropping systems.

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