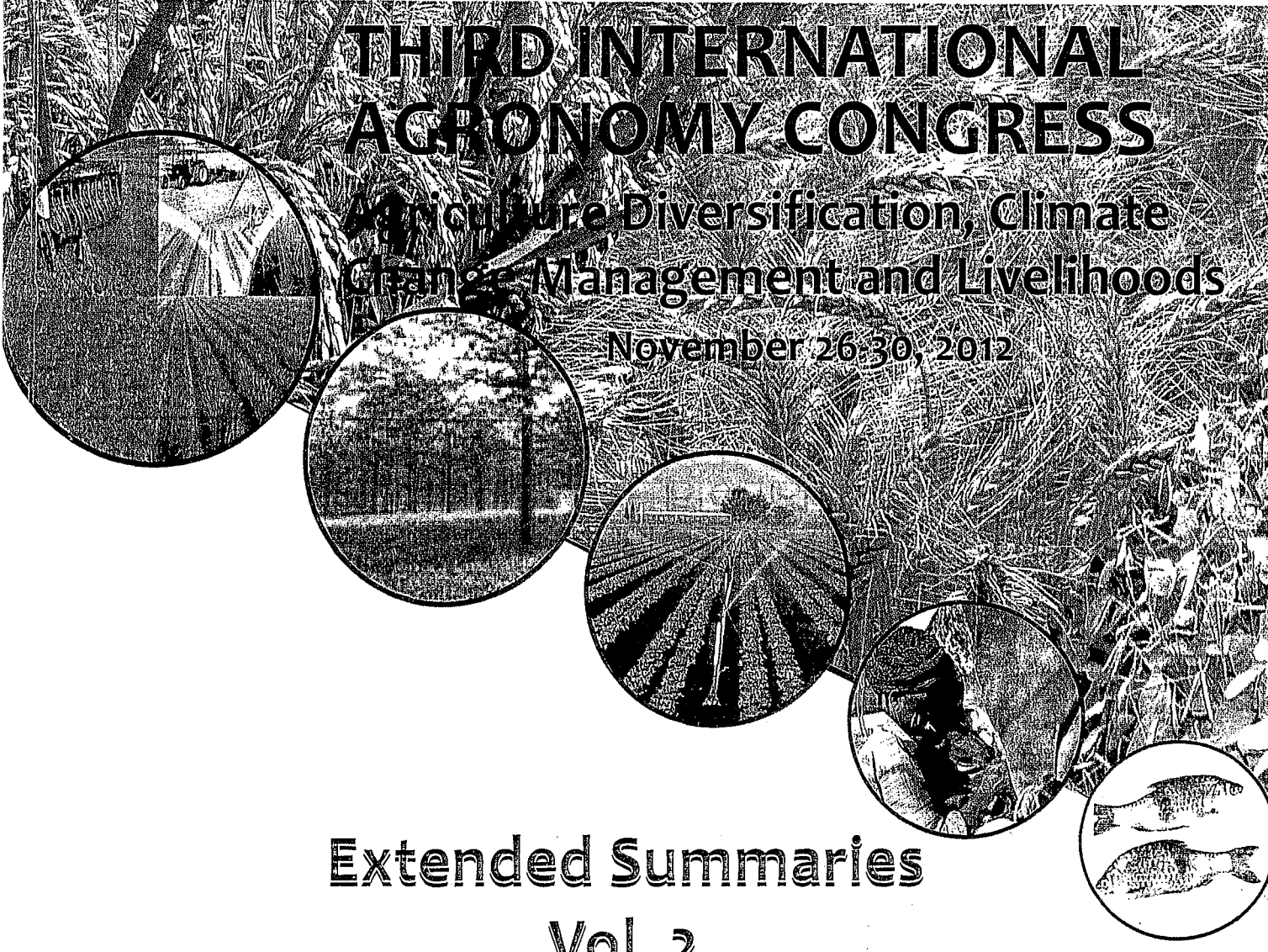

THIRD INTERNATIONAL AGRONOMY CONGRESS

Agriculture Diversification, Climate Change Management and Livelihoods

November 26-30, 2012

Extended Summaries
Vol. 2

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Agronomy, Ecology and Climate Resilience
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Enhancing water use efficiency of maize–chickpea sequence under semi arid conditions of southern India

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Maize is one of the three most important cereal crop species (after wheat and rice), and is grown throughout a wide range of climates. Maize is desired for its multiple purposes as human food, animal feed, and pharmaceutical and industrial manufacturing, corn syrup and oil. Similarly, potential economic and

environmental benefits of growing chickpea (*Cicer arietinum* L.) have been increasingly recognized in semiarid condition and inclusion of chickpea in cereal-based cropping systems has shown to improve the efficiency of nutrient (Walley et al., 2007). WUE of maize is a function of multiple factors, including physiological characteristics of maize and chickpea, genotype, soil characteristics such as soil water holding capacity, meteorological conditions and agronomic practices. Hence, to improve WUE, integrative measures should aim to optimize agronomic practices *viz*, efficient irrigation methods and suitable landform management and improved practice of fertilization.

METHODOLOGY

Field experiments were conducted during 2009 to 2011 on experimental farms at ICRISAT, India (17.50° N 78.50° E and altitude 545 m). Soil of experimental area was medium black having a depth of 150 cm, clayey in texture, and slightly alkaline in pH (8.1). A split-split plot design was adapted to include two irrigation methods (flood and drip) as main plot, two landform managements (BBF and Flat system) as sub-plot whereas two farming practices (farmers practice and improved practice) were placed as sub-sub-plot. Thus, there were total 8 combinations of treatments and each of them had four replications. Water use efficiency (kg/m^3) with respect to the total water input (rainfall + Irrigation) is the ratio of maize equivalent yield for both the cropping season (kg ha^{-1}) and amount of rainfall received during maize and chickpea crop and amount of irrigation applied suing chickpea crop (rainfall + irrigation, in mm).

RESULTS

Perusal of data in Table 1 revealed that irrigation methods did not influence significantly all these yield and economics parameters except chickpea grain yield which was significantly highest with drip irrigation. Profound effect was observed with respect to landform management wherein broad bed and furrow system was found significantly superior to improve all the yield and economic parameters. With the BBF, there was 13.85, 14.40, 13.60 per cent increase in yield of maize, chick pea and maize equivalent yield of system respectively over flat planting whereas an increase of 12.7 and 14.2 per cent was recorded for gross and net monitory returns ha^{-1}.

As regards to management practice, improved practice of applying recommended dose for maize and chickpea along with 50 kg $ZnSO_4$ and 2.5 kg agribor/ha was found most suitable in increasing maize based system equivalent yield by 12 per cent over farmers practice of applying 1 bag of DAP as basal and 1 bag of urea as top dressing. The data on water use efficiency (Table 1) evidently concealed that highest water use efficiency of the maize – chickpea system recorded significantly higher WUE under drip system of irrigation coupled with BBF and improved management practices, similar response with chickpea was observed by Miller *et al.*, (2003) and Lenssen *et al.*, (2007). Consistently greater water use efficiency of maize - chickpea grown on BBF system coupled with improved management practices was probably attributable to (i) improved overall plant health and vigour because of border effect experienced by maize and chickpea with BBF, and (ii) greater water availability in the soil furrows which helped the storage of more water in the soil profile.

CONCLUSION

It can be concluded that in order to make maize–

Table 1. Pooled data on yields, economics and WUE of maize–chickpea cropping system

Treatments	Pooled data on maize yield (t/ha)	Chickpea yield (t/ha)	System MEY (t/ha)	Gross returns (₹/ha)	Net monetary returns (₹/ha)	B : C ratio	WUE
Irrigation method							
Flood irrigation	3.866	1.985	9.145	81,053	53,803	2.97	1.02
Drip Irrigation	3.974	2.239	9.905	88,992	61,742	3.26	1.11
LSD (P=0.05)	N.S.	0.141	0.330	N.S.	N.S.	N.S.	0.04
Land form management							
Flat system	4.174	2.254	10.134	90,109	61,609	3.17	0.75
BBF	3.666	1.970	8.916	79,935	53,935	3.06	0.71
LSD (P=0.05)	0.048	0.09	0.196	6,586	6,585	0.10	0.03
Management practice							
Farmers practices	3.732	1.976	8.994	81,786	54,536	2.99	1.02
Improved practices	4.107	2.248	10.056	88,259	61,009	3.24	1.12
LSD (P=0.05)	0.074	0.066	0.197	3,127	3,127	0.12	0.03

chickpea cropping system remunerative and profitable, we have to adopt good agronomic management practices including suitable method of irrigation *viz.* drip in combination with broad bed and furrow system along with supplying improved practices of fertilization along with micronutrients viz, $ZnSO_4$ and agribor.

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