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Efficacy of technological intervention on production potential of diversified farming system in Panchmahals district, Gujarat

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ABSTRACT

The present study the efficacy of technological intervention on production potential of diversified farming system was conducted at Godhra, Kalol, Halol and Lunawara Talukas of Panchmahals district of Central Gujarat during the year 2010-12. Seven components like maize, fodder, vegetables, fruit crops, dairy, goatry and poultry were considered for study. Keeping these aspects in view, the influence of technological intervention on scientific farming system with comparisons to traditional farming system was worked out. The average land holding of selected farmers was 1.22 ha. Results of the study revealed that the production of maize, fodder, vegetables, fruit crops, dairy, goatry and poultry under scientific farming system was significantly influenced as compared to traditional farming system. The percentage increase in the production of maize, hybrid Napier and lucerne, tomatoes, chilly, brinjal, fruits, milk and egg in scientific farming system was recorded 47.2, 45.52, 37.32, 41.46, 41.66, 65.99, 37.25 and 152.29 respectively over traditional system. Similarly the average net return and cost benefit ratio was also computed significantly higher in scientific than traditional farming system. Overall observations after integrating different components of farming system, it may inferred that the production, productivity, economic returns, balance nutrition along with better employment can be improved by adopting diversified farming system under semi-arid ecosystem of western India which have not only alleviated the socio-economic condition of farmers, but also provided sustainability in productivity by following of various scientific technologies over traditional farming.

Key words: Crops, Cattle, Fruits, Goatry and Poultry, Scientific farming system, Traditional farming system, Vegetable

Indian agriculture is an economic symbiosis of crop and livestock production. More than 70% of the marginal and small farmers possess 21.5% of land holdings, while the rest 78.5% is owned by big farmers (Anonymous 1995). The concepts associated with diversified farming system are practiced by most of the farmer's worldwide. A common characteristic of these systems is that they invariably have a combination of crop and livestock enterprises. Farmers keep cows, buffaloes, sheep and goats and also small flocks of poultry in backyard to meet their domestic needs. Therefore, livestock has become an integral part of farming system. Other agricultural components like fruit crops, plantation, vegetables and agro-forestry are also prevalent in homesteads. These units are operated either solely or in combinations depending upon the size of the land holding, agro-climatic conditions and other available resources. Diversified farming system is to reinforce the positive influences of sustainable agricultural production and at the same time it reduces the negative impacts on farming system. The rationale behind integrated farming is to minimize wastes from the various sub systems on the farm, since the wastes or byproducts from each sub system are used as inputs to other sub systems to improve and sustain the productivity and minimize the cost of production of the various sub systems (Edward *et al.* 1986). Diversified farming system can play a great role in sustaining agricultural production in tribal area by increasing employment opportunities, nutrition and income of rural population. There is a tremendous scope for increasing the agricultural production and productivity of our livestock by adopting scientific farming practices. A very few studies have been carried out which have direct relevance to the technological intervention. Based on the problems faced by farmers, a questionnaire was formulated and technological intervention strategies were imposed to improve the production and productivity of crops and livestock by the applying various useful scientific farming practices. Keeping these facts in background, the present study was carried out to investigate the impact of technological interventions on the overall performance of diversified farming system in Panchmahals district of central Gujarat.

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Table 1 Criteria under emphasis for technological intervention on different components of diversified farming system

Component	Criteria	TFS	SFS
Maize/Fodder/ Vegetables production	Varieties	Local strain	Hyvs suits to this region
	Type of seed	Unrecognized	Certified seed
	Method of cultivation	Traditional	Improved scientific
	INM	INM not followed	recommended dose of manor& fertilizers
	IPM	Haphazard use	Use of IPM Tools
Fruit production	Planting materials	Local planting materials	Improved and genuine planting materials
	INM	Less than recommended dose of manor & fertilizers	recommended dose of manor& fertilizers
	Irrigation	Not certain	Proper irrigation
	Mulching	Not fallowed	Use of biodegradable mulching materials like paddy and maize straw
	Training and pruning	Not aware	Fallowed properly
	IPM	Only chemicals use	Use of IPM Tools
Dairy/goat farming	Breed	Local/Nondescript	Cross breed/ pure breeds
	Feed and fodder	Based on house hold wastage	Balance ration feeding
	Mineral mixture feeding	Not followed	Feeding properly
	Health management	Scientific processor not followed	Proper deworming and vaccination
Backyard poultry	Breed	Local/Nondescript	Improved strain, *viz* Nirbheek/Pratap Dhan
	Feed	Scavenging/wastage materials	balance concentrated mixture feed
	Health management	Not proper	Proper vaccination

MATERIALS AND METHODS

The data in present study were collected from 120 farmers' families with a cluster of 60 trained farmers for scientific farming system (SFS) and 60 untrained farmers for traditional farming system (TFS) dwelling in Godhra, Kalol, Halol and Lunawara Talukas of Panchmahals district of Gujarat during the year 2010-12. Seven components, i.e. maize, fodder, vegetables, fruit crops, dairy, goatry and poultry were studied. Based on criteria, the influence of technological intervention on scientific farming system with comparisons to traditional farming system was worked out (Table 2 and 3). Accordingly, strategies of technological intervention were *notabene* regularly during the period of study. Selected farmers were provided the informations through precise extension tools like training programmes, advisory services, animal health camps, and FLDs on the utility of concentrate and mineral mixture feeding, green fodder maize, vegetables and fruit crops production, etc during the period of study and the impact of technological interventions were carried out to assess, refine and improve the production and productivity of crops and livestock. During the study period, the expert personnel from Krishi Vigyan Kendra-Panchmahal visited the farmers' household as per schedule and collected necessary information through interviews as per formulated questionnaires. The interviews were conducted individually as well as in groups with the respondents. However, while interviewing in the groups, participant observation method was also employed to observe the farmers' perceptions and regarding knowledge of profitability of different farming systems. The data on cost of different inputs and return from outputs for different systems (SFS, and TFS) were also recorded from each farmer. The collected data were subjected to basic statistical analysis as per Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

Socio-economic

The data on socio-economic status of the farmers are clearly indicate that majority of the farmers (60.00%) belonged to middle age group. The participants of young and high age group in the crops and livestock production

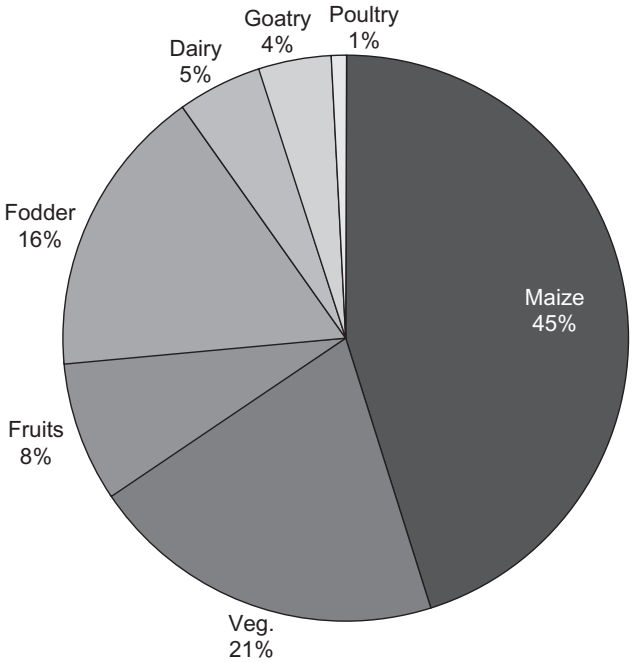

Fig 1 Proportionate share (%) different components in farming systems

activities were relatively low, i.e. 28.33% and 11.66%, respectively. The reasons behind this might be due to declining health of old people and more attractive avenues of income for younger. However, middle age group has realized and recognized agricultural production as a suitable means of overcoming their financial hardship. Scientific farming system has been documented time and again as a suitable venture for farmers and farm women as it provides both income as well as employment at homestead level. The majority of farmers (47.67%) have acquired primary level of education, whereas 41.16% farmers had middle and above level of education, and 11.17% farmers were illiterate in the study area. The average holding of each farmer was 1.22 ha. The average area under different components in farming systems are given in Fig 1.

Maize production

Maize is the staple food for more than 90% population of Panchmahals and is the major component of all the farming system of Panchmahals district of central Gujarat. The data in present study revealed that the production of maize and stover under scientific farming system was recorded significantly higher as compared to maize grown under traditional farming system. A comparison of productivity levels between scientific and traditional farming system is presented in Fig 2, during the period of study, it was observed that the maize cultivation under SFS recorded the higher grain (41.60 q/h) and stover yield (50.98 q/h) than TFS (28.26 q/h and 40.79 q/h). The percentage increase in the grain and stover yield was recorded 47.20 and 24.98, respectively over traditional farming system. The main reason of low yield of maize under traditional farming system was mainly due to use of poor quality seeds and use of traditional methods in maize cultivation with very poor nutrient and weed management. Farmers who practice scientific farming with uses of high yielding verities of maize and adopted scientific maize cultivation practices like line and early time sowing, proper use of manure and fertilizers with time to time and proper weed management recorded 47.20 percent higher maize yield over traditional system. These findings are in accordance with the results reported by Chauhan (2010), Rathore *et al.* (2011), Yishak Gecho and N K Panjabi (2011) and Yadav *et al.* (2013) reported that an increasing yield in scientific farming system than traditional farming system under front line demonstration. Economic analysis of the yield performance

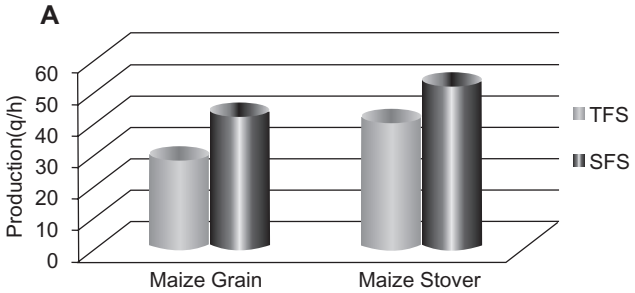

Fig 2 Production of maize

of maize revealed that scientific farming system recorded higher gross returns (₹ 45 606/h) and net return (₹ 16 206/h) with higher benefit ratio (1:1.55) as compared to (1:1.25) traditional farming system.

Fodder production

A comparison of productivity levels between scientific and traditional farming system is shown in Fig 3. During the period under study, it was observed that in scientific farming system, the improved variety of hybrid Napier APBN 1 and lucerne variety Anand 2 recorded the highest green fodder yield 975 q/h and 276.76 q/h respectively with compared to traditional farming system (670 q/h) and (175.38 q/h). The percentage increase in the yield of hybrid Napier and lucerne under scientific farming system was recorded 45.52 and 58.28 respectively over traditional system. More or less yield enhancement in different crops in improved farming system has amply been reported by Hiremath *et al*. (2007), Mishra *et al*. (2009), Kumar *et al.* (2010) and Dhaka (2010). The data related to economic analysis of hybrid Napier and lucerne presented in Table 2 revealed that scientific farming system recorded higher gross returns and net return with higher benefit ratio than traditional farming system. From these results it is quite obvious from the study that the scientific and suitable management practices of high yielding variety was found

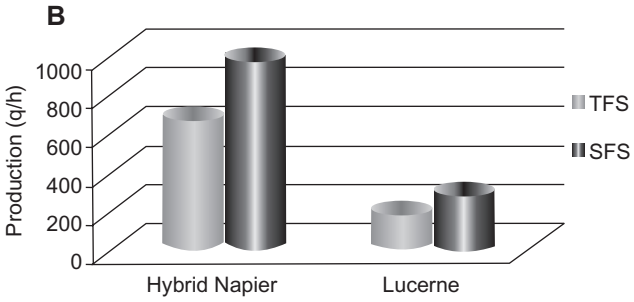

Fig 3 Production of green fodder

better than the traditional farming system.

Vegetable production

Vegetables are mostly grown for household consumption at small and also for commercial cultivation for selling in local market at remunerative price. In Panchmahals, farmers are growing mainly solanacious, cucurbitaceous and cruciferous crops at commercial scale. The progressive farmers of the area grow high value vegetables like colored capsicum, cole crops, tomatoes, cucumber and moringa in scientific manner and getting higher income. The results of present study, revealed that the average production of tomatoes, chilly and brinjal was recorded 195, 116 and 255 q/h in scientific farming system and 142, 81 and 185 q/h in traditional system of farming, respectively. The percentage increase in the yield of tomatoes, chilly and brinjal under scientific farming system was recorded 37.32, 41.46 and 41.66 respectively over traditional farming system (Fig 4). The higher vegetable

Table 2 Average cost of cultivation and Net returns of different farming system

Crop	Average cost of cultivation(₹/h)		Average gross return(₹/h)		Average net return (₹/h)		B:C ratio	
	SFS	TFS	SFS	TFS	SFS	TFS	SFS	TFS
Maize	29400	28100	45606	35200	16206	7100	1.55	1.25
Tomato	42000	39000	107250	85000	65250	46000	2.55	2.17
Chilli	35000	33000	89600	64200	54600	34200	2.56	1.94
Brinjal	41800	38000	102000	78000	60200	40000	2.44	2.05
Mango	32500	21900	93600	42120	61100	20220	2.88	1.92
citrus	27800	19650	72022	33240	44220	13590	2.59	1.69
Poultry	8167	7176	36275	17050	28099	9874	4.43	2.37
Hybrid Napier	27560	22829	69900	46560	42340	23731	2.53	2.03
Lucerne	25500	23500	55352	35076	29852	11576	2.17	1.49
Dairy	25550	22630	61120	41400	35570	18770	2.39	1.82
Goatry	16650	13500	43100	31040	26450	17540	2.58	2.29

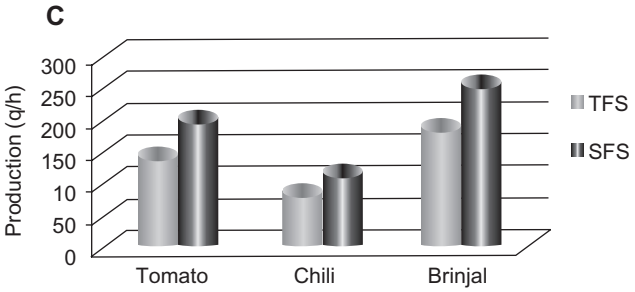

Fig 4 Production of vegetables

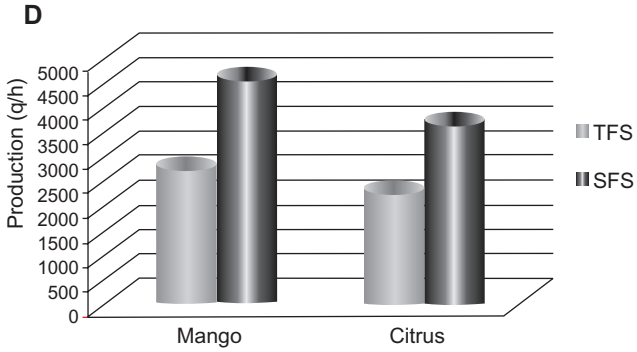

Fig 5 Production of fruits

production in scientific farming system might be due to use of quality planting material and better management practices adopted by the farmers. The average net return was recorded significantly higher in scientific farming system than traditional farming system (Table 2). The results of the present study are in accordance with the findings of Brahma *et al.* 2010, Patel and Rajput, 2003 and Yadav *et al.* 2013.

Fruit crop production

The fruit crops are grown as integral components of any farming system in the form of small orchard and boundary planting. In Panchmahals district mainly mango and citrus fruits crops are grown by small farmer for household consumption and excessive produces sold out in the local market. The large or medium farmers of the area grow fruit crop in scientific manner and got higher income. The results of present study revealed that the average production of mango and citrus was recorded 4583 and 3601 kg/h in scientific farming system and 2704 and 2216 kg/h in traditional system of farming, respectively. On an average, the production of fruit in scientific farming system was found to be 65.99 per cent higher as compared to production recorded under traditional farming system (Fig 5). The data related to economic analysis of fruit production presented in Table 2 revealed that scientific farming system was recorded higher gross returns (₹ 93 600) and net return (₹ 61 100) with higher benefit cost ratio (2.88) than traditional farming system. The higher fruit production in scientific farming system might be due to use of quality planting material of improved varieties and better management practices like balance nutrient management, use of mulching, use of micro irrigation, fertigation and effective management of insect pest followed by the farmers. The increase in fruit yield with improved practices could be attributed to better vegetative growth, better availability of nutrients at vital growth period and greater synthesis of carbohydrates and their translocation to the storage organs (Ghosh 2008 and Yadav *et al*. 2013).

Dairy farming

The results of the present study revealed that the average milk production of cow and buffaloes was recorded 8.65 and 6.90 liter in scientific farming system and 6.10 and 5.12 liter in traditional farming system respectively. The average increase in milk production of cow and buffaloes was recorded 41.69 and 34.76 percent respectively in scientific management system of dairy animals as compared to traditional system. The higher milk production of cows and buffaloes might be due to better management of housing, feeding like use of balance ration, feeding of mineral mixture and breeding and health management practices adopted by the farmers. The data related to economic analysis of milk production from cow and buffaloes were presented in Table 2 revealed that scientific farming system recorded higher gross returns and net return with higher benefit ratio than traditional way of farming system. Murai and Singh (2011),

Sathiadhas *et al.* (2003) and Yadav *et al.* (2013) also reported that the productive performance of cattle depends heavily on the scientific dairy farming practices.

Goat farming

Goat husbandry plays a vital role in the rural economy in supplementing the income of rural house hold particularly the landless, small and marginal farmers. The overall means for birth weight and body weight at 3, 6, 9 and 12 months was recorded 2.49±0.52, 11.56±0.90, 20.45±1.12, 23.23±2.14 and 26.41±1.27 kg in scientific farming system and 2.07±0.56, 9.42±1.06, 14.50±1.10, 17.65±1.12 and 20.16±1.22 kg in traditional farming system, respectively. Analysis of study revealed that the goats were significantly heavier in body weight in scientific farming system than traditional system at all stage of ages. The results of study also indicate that the average milk yield of goats in group scientific farming system was recorded 35.32 per cent higher as compared to goats reared under traditional system. The average net return (₹ 26 450) and cost benefit ratio (2.58) was recorded significantly higher in scientific than traditional farming system (Table 2). These finding are in accordance with Pathodiya *et al.* (2010).

Backyard poultry farming

Tribal rural families of Panchmahal is habituated in backyard poultry keeping and every household maintain about 15-20 birds. Nirbhik and Pratap Dhan strain of poultry are being reared by the trained farmers in the group of scientific farming system and non descript local Desi type poultry birds with low egg and meat production are being reared traditionally by the farmers in the group of traditional farming system. Breed, stain, and proper management system in respect to good housing, balanced feeding, proper nursing, vaccination etc. are the major factors responsible for profitability of poultry farming. The results of study revealed that the body weight of chicks at 4, 10, 16 and 20 weeks of age was found to 265.77±6.39, 742.65 ±16.48, 1565 ±0.03 and 2306 ±0.017 g in the scientific farming system and 210.77±6.39, 565.45±22.68, 1220±0.11 and 1428±0.028 g under traditional system, respectively. The results related to egg production revealed that the average egg production was recorded 137.50±17.25 and 54.50±11.50 in scientific and traditional farming system, respectively. In the present study, 61.48 and 152.29 per cent more meat and egg production was recorded under scientific farming system than traditional farming system. The average net return and cost benefit ratio was recorded significantly higher in scientific than traditional farming system (Table 2). These findings are in line of earlier reported (Ershad 2005 and Yadav *et al.* 2013)

Employment generation

Scientific farming system generated the additional employment of family members of farming and non-farming families. On an average 299 man days were utilized under scientific farming system as compared to 211 man days under traditional farming system. Moreover, women participation was 45.5% in scientific and 24.9% in traditional farming system as compared to men (36% in SFS, 33% in TFS). Dairy farming followed by goatry, vegetables and Backyard poultry farming was the top most enterprises for engaging the household men and women for longer duration. Thus scientific integrated farming system is suitable for ensuring sustainable livelihood for rural farmers of Panchmahal district of central Gujarat.

CONCLUSION

Based on the observations on integration of different components of farming at Panchmahal districts of central Gujarat, it may inferred that the production, productivity, economic returns, balance nutrition along with better employment can be generated and achieved by adopting diversified farming system (crops, fruits, vegetable, cattle, goatry and poultry) under semi arid ecosystem of western India which have not only alleviated the socio-economic condition of farmers but also provided sustainability in productivity by adopting of various scientific technologies over traditional farming.

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