ECONOMICS OF HORTIBASED FARMING SYSTEM OF WESTERN MAHARASHTRA

DR.J.T.DORGE, DR.D.B.YADAV

Abstract: Indian agriculture is known for its multi-functionalities of providing employment, livelihood, food, nutrient and ecological securities. The income from cropping alone on small and marginal farms is hardly sufficient to sustain the farmer's family with the decline in farm size (0.15 ha. /person) due to explosion of population and this situation gets further weakened due to failure of monsoon. The farmer, has to be assured of a regular income for a satisfactory living (above the poverty line), a judicious mix of any one or more enterprises with agronomic crops ensures better farm income. Therefore, in the present study, comparative economics of various farming systems have been workout for ascertaining the sustainability of most profitable one.

Introduction: The three widely adopted farming systems were selected for the study viz; I) Crops only, II) Crops + Livestock, III) Crops + Livestock + Horticulture crops. The two districts viz; Ahmednagar and Solapur were selected purposively. In Ahmednagar district, Sangamner tahsil was selected as irrigated tahsil and Pathardi tahsil was selected as rainfed tahsil. From Solapur district, Pandharpur as irrigated tahsil and Sangola, as rainfed tahsil were selected. From each tahsil, three villages were selected, randomly and from each village, 15 farmers were selected in such way that, 5 farmers from each farming system (F.S.I-Crops only, F.S.II-Crops + livestock, and F.S.III- Crops + livestock + horticulture) were get selected. As such, 180 sample farmers were selected for the study. The primary data were collected by survey method from the selected farmers with the help of specially designed schedules for the year 2007-08.

The comparative picture of the employment pattern showed that, the employments generated were more in irrigated region as compared with the rainfed region because in irrigated region, irrigated crops such as sugarcane, wheat, fodder etc. required more labours. The own farm employment was more in farming system-III of irrigated region. In all the farming systems, owned and hired male-female played significant role in crop production activity as compared to other activities of production.

The per farm income pattern indicated that, the total income in farming system- II was double than the farming system-I, while total income of farming system- III was four fold than that of farming system-I. The total income from farming system- I (crop production activity) was very less as compared to farming system- II and III. The itemwise income indicated that, the more than 50 per cent income was derived from crop production in farming system- I and II, while in farming system- III, more than 50 per cent income was derived from horticulture and in the farming system- I, 31.52 per cent income was derived from other than farm business activity but in farming system- II and III, correspondingly, just 3.09 and 1.79 per cent income was derived from other than farm business activity. This has indicated that farming system- I, depends more on other than farm business activity as compared to farming system- II and III.

In expenditure pattern, out of the total expenditure more than 70 per cent was the farm expenditure in all the farming systems. The expenditure on crop production was the major expenditure in farming system- I and II, while expenditure on horticulture was major expenditure in farming system- III. The regionwise total expenditure was more in irrigated region than the rainfed region

The economic sustainability depends on profitable enterprises, family saving and the family debt. The sustainable farm income means the annual income from farm activities which meets the annual expenditures of farm and family and remains surplus to the farm family for saving or repayment of debt. The regionwise sustainable farm income indicated that, farming system- II and III, were having the sustainable farm incomes in both the regions. But farming system- I of irrigated and rainfed region could not meet their requirements on farm business income i.e. income from crop production activity alone. They have a deficit in income.

Farmers of farming system-II and III of both regions were having sustainable farm income, but the farming system- I was not having sustainable farm income. After adding the income from other sources,

farmers in farming system-I, had sustainable farm income, in both the regions. Therefore, the income from other sources (wages, service and business etc.) was the only factor, which helped them to become sustainable.

Farming systems research with a farmers' perspective occupies pride place in India's agricultural research agenda. There is a need to identify the location specific farming systems and popularize it, which will be helpful to raise the standard of living of farm families by ensuring enough employment opportunities. The Government of India has given top priority for regional development by exploring the agricultural potential of the region for which it has the comparative advantage. In the Eleventh Five-Year Plan, greater emphasis has been laid on integration of crop production with subsidiary activities like dairy, poultry etc.as one of the measures to solve problems of seasonality in income and employment, high risk and uncertainty associated with crop farming.

The Maharashtra State has made rapid strides in the production of cash crops like sugarcane, soybean, cotton, oilseeds and onions. The last few years have seen a healthy shift towards horticultural crops. The State is well known for its mangoes, grapes, bananas, pomegranates and oranges. Animal husbandry output constitutes about 30 per cent of the country's agricultural output and the share of Animal husbandry in GSDP of Agriculture and allied activities sector during 2009-10 was 7.8 per cent. The state's share in livestock and poultry population of India was 6.8 per cent and 9.9 per cent, respectively. The state ranks sixth in India in livestock and poultry population.The production of milk at the State level was 7.7 million tons and the per capita daily availability was 190 gms/day while the production of milk at All-India level was 112.50million tons and the per capita daily availability was 263 gms/day during the year 2009-10.

Farm income varies under different situations like rainfed and irrigated cultivation and farm supported with subsidiary activities like dairy, poultry etc. Increasing productivity of small farms and creating multiple livelihood opportunitiesthrough crop-livelihood integrated farming systems as well as agro-processing, provide the answer for varying income levels. The existing practices of different farming systems in the region give exact idea of the returns.

There are several farming systems viz: crop based, horticultural based, dairy based and their combinations. The profitability of different crop and livestock combination is varying from region to region and even within the region also. Therefore, in the present study, comparative economics of various farming systems have been workout for ascertaining the sustainability of most profitable one.

Data and Methodology: The three widely adopted farming systems in Western Maharashtra were selected for the study viz; I) Crops only, II) Crops + Livestock, III) Crops + Livestock + Horticulture crops. The two districts viz; Ahmednagar and Solapur were selected purposively, on the basis of gross cropped area and livestock population. Further the study area was stratified into two situations, viz. irrigated and rainfed area. From Ahmednagar district, Sangamner tahsil was selected as irrigated tahsil and Pathardi tahsil was selected as rainfed tahsil and from Solapur district, Pandharpur as irrigated tahsil and Sangola, as rainfed tahsil were selected. Thus, total four tahsils were selected purposively on the basis of having highest net irrigated area and lowest net irrigated area from each district. From each tahsil, three villages were selected, randomly. In all, 12 villages were selected. From each village, 15 farmers were selected in such way that, 5 farmers from each farming system (F.S.I-Crops only, F.S.II-Crops + livestock and F.S.III- Crops + livestock + horticulture) were get selected. As such, 180 sample farmers were selected randomly for the study. The primary data were collected by survey method from the selected farmers with the help of specially designed schedule for the year 2007-08.

Results and Discussion:

Family size: The family size plays an important role in determining the capacity to save and re-invest in farming. It was found that the family size of different farming systems ranged from 5.70 to 6.64 members in irrigated region, while in rainfed region; it ranged from 5.43 to 6.47 members.(Table 1 and 2)

Table 1 Composition of the farm families in irrigated region					
Sr.No.	**Particulars**	**Irrigated region**			
		I (Crops only)	II (C+L)	III (C+L+H)	Total
	Family size (No./farm)	5.70	6.63	5.87	
I.	Small (≤6 members)	14 (46.67)	10 (33.33)	21 (70.00)	45 (50.00)
II.	Large (>6members)	16 (53.33)	20 (66.67)	9 (30.00)	45 (50.00)
	No. of families	**30 (100.00)**	**30 (100.00)**	**30 (100.00)**	**90 (100.00)**

[C+L = Crops + Livestock, C+L+H = Crops + Livestock + Horticulture]
(Figures in the parentheses are the percentages to the total)

Table 2 Composition of the farm families in rainfed region					
Sr.No.	**Particulars**	**Rainfed region**			
		I (Crops only)	II (C+L)	III (C+L+H)	Total
	Family size (No./farm)	5.57	5.43	6.47	
I.	Small (≤6 members)	16 (53.33)	17 (56.67)	14 (46.67)	47 (52.22)
II.	Large (>6members)	14 (46.67)	13 (43.33)	16 (53.33)	43 (47.78)
	No. of families	**30 (100.00)**	**30 (100.00)**	**30 (100.00)**	**90 (100.00)**

[C+L = Crops + Livestock, C+L+H = Crops + Livestock + Horticulture]
(Figures in the parentheses are the percentages to the total)

Land use pattern: The land holding of the sample farmers of the irrigated and rainfed region of study area is presented in Table 3.

Table 3 Land use pattern of farming systems.(ha./farm)							
Sr.No.	**Particulars**	**Irrigated region**			**Rainfed region**		
		Farming system I (Crops only)	Farming system II (C+L)	Farming system III (C+L+H)	Farming system I (Crops only)	Farming system II (C+L)	Farming system III (C+L+H)
		N=30	N=30	N=30	N=30	N=30	N=30
1	Total land	1.61	1.72	1.49	1.42	1.61	1.78
2	Permanent fallow	0.03	0.03	0.06	0.02	0.04	0.05
3	Operational land	1.58	1.69	1.43	1.40	1.57	1.73
4	Current fallow	0.01	0.03	0.01	0.02	0.01	0.04
5	Area under cultivation	1.57 **(100.00)**	1.66 **(100.00)**	1.42 **(100.00)**	1.38 **(100.00)**	1.56 **(100.00)**	1.68 **(100.00)**
a	Irrigated	1.05 (66.88)	1.25 (75.30)	1.11 (78.17)	0.32 (23.19)	0.63 (40.38)	0.67 (39.88)
B	Unirrigated	0.52 (33.12)	0.41 (24.70)	0.31 (21.83)	1.06 (76.81)	0.93 (59.62)	1.01 (60.12)

(Figures in the parentheses are the percentages to the area under cultivation)

In irrigated region, 1.61, 1.72 and 1.49 hectares was the average land holding and actual area under cultivation was 1.57, 1.66 and 1.42 hectares, in farming system-I, II and III, respectively. Out of that, 66.88, 75.30 and 78.17 per cent was irrigated land and 33.12 per cent, 24.70 and 21.83 per cent was unirrigated land in farming system -I, II and III, respectively. The average land holding was maximum in farming system II and the actual area under cultivation was maximum also in this farming system, but the irrigated land was maximum in farming system III.

In rainfed region, 1.42,1.61 and 1.78 hectares was the average land holding and the actual area under cultivation was 1.38, 1.56, and 1.68 hectares in farming system-I, II and III, respectively. Out of that, 23.19 per cent, 40.38 per cent and 39.88 per cent was irrigated land and 76.81 per cent, 59.62 per cent and 60.12 per cent unirrigated land in farming system-I, II and III, respectively. The average land holding was maximum in farming system- III and actual area under cultivation was maximum also in the farming system-III, but the irrigated land was maximum in farming system- II.

Average land holding was greater in farming system-I and II of irrigated region than the farming system- I and II of rainfed region but in the case of farming system- III, the average land holding was more in rainfed region than irrigated region. The irrigated land was more in irrigated region than in rainfed region in all the farming systems.

The main activity of the farmer is to cultivate land and grow crops in such a way so as to make the efficient use of labour to secure the maximum income. However, owing to limitation of land holding and irrigation, all the family members do not find adequate employment in crop production activity throughout the year. At the overall level, irrespective of the region, the total own farm employment generated was 113.44, 248.89 and 304.78 mandays in farming system-I, II and III, respectively.

Employment pattern: The details of sourcewise employment pattern of the per farm male and female workers in different farming systems is presented in Table 4 in next page.

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The regionwise employment indicated that in irrigated region, the total own farm employment was 128.78, 273.66 and 338.25 mandays on the farming system -I, II and III, respectively. Out of the total employment generated in farming system-I, 95.03 per cent employment was generated through crop production activity and 4.97 through manures of draught animals, but in farming system-II, 62.74 percent employment was generated through crop production and 37.26 per cent through livestock activities, while in farming system-III, 41.37 per cent through horticulture activity, indicating maximum employment generated through horticulture activity and 34.05 per cent employment being generated through crop production activity and 24.58 per cent through livestock .

In rainfed region, the total own farm employment generated was 98.09, 224.11 and 271.30 mandays for farming system-I, II, III, respectively. Out of the total employment generated in farming system-I, 95.25 per cent employment was generated through crop production activity and 4.75 through draught animals and in farming system-II, 60.86 per cent employment was generated through crop production activity and 39.14 per cent by livestock activity while in farming system-III, highest employment generated through horticulture (34.10 per cent) followed through crop production (33.11 per cent) and livestock activity (32.79 per cent).

The comparative picture showed that, the employment generated were more in irrigated region as compared with the rainfed region because in irrigated region, irrigated crops such as sugarcane, wheat, fodder crops etc. require more labours. The own farm employment was more in farming system-III of irrigated region. In all the farming systems owned and hired male-female played significant role in crop production activity as compared to other activities.

Table.4Employment pattern on sample farm (Mandays/farm)

Sr.No.	Particulars		Farming system I (Crops only)			Farming system II (Crops + Livestock)			Farming system III (Crops + Livestock + Hort.)		
			Irrigated	Rainfed	Overall	Irrigated	Rainfed	Overall	Irrigated	Rainfed	Overall
1.	**Crop production**										
	a. Male	Owned	76.90	49.85	63.38	87.92	63.68	75.80	55.32	36.43	45.88
		Hired	38.40	26.46	32.43	54.46	27.55	41.01	51.52	32.36	41.94
	b. Female	Owned	40.73	40.88	40.81	45.07	49.02	47.05	44.61	22.11	33.36
		Hired	57.18	40.42	43.80	49.39	32.96	41.18	29.03	34.59	31.81
	Subtotal		**213.21 (95.03)**	**157.61 (95.54)**	**180.41 (95.12)**	**236.84 (62.74)**	**173.21 (60.86)**	**205.03 (61.93)**	**180.48 (34.05)**	**125.49 (33.11)**	**152.99 (33.65)**
2.	**Livestock**										
	a. Male	Owned	9.14	5.76	7.45	113.50	105.44	109.47	116.51	118.40	117.46
	b. Female	Owned	2.01	1.60	1.81	27.17	5.97	16.57	13.80	5.90	9.85
	Subtotal		**11.15 (4.97)**	**7.36 (4.46)**	**9.26 (4.88)**	**140.67 (37.26)**	**111.41 (39.14)**	**120.04 (38.07)**	**130.31 (24.58)**	**124.30 (32.79)**	**27.31 (28.00)**
3.	**Horticulture**										
	a. Male	Owned	-	-	-	-	-	-	73.49	62.88	68.19
		Hired	-	-	-	-	-	-	68.83	21.88	45.36
	b. Female	Owned	-	-	-	-	-	-	34.52	25.58	30.05
		Hired	-	-	-	-	-	-	42.49	18.91	30.70
	Subtotal		**-**	**-**	**-**	**-**	**-**	**-**	**219.33 (41.37)**	**129.25 (34.10)**	**174.29 (38.35)**
4.	**Grand total**										
	a. Male	Owned	86.04	55.61	70.83	201.42	169.12	185.27	242.32	217.71	230.02
		Hired	38.40	26.46	32.43	54.46	27.55	41.01	120.35	54.24	87.30
	b. Female	Owned	42.74	42.48	42.61	72.24	54.99	63.62	92.93	53.59	73.26
		Hired	57.18	40.42	43.80	49.39	32.96	41.18	71.52	53.50	62.51
	Total		**224.36 (100.00)**	**164.97 (100.00)**	**189.67 (100.00)**	**377.51 (100.00)**	**284.62 (100.00)**	**331.07 (100.00)**	**530.12 (100.00)**	**379.04 (100.00)**	**454.58 (100.00)**
	Total own farm employment		128.78	98.09	113.44	273.66	224.11	248.89	338.25	271.30	304.78

Income pattern: The detail of source wise income of farms families in different farming systems is presented in Table 5.

Table. 5 Income pattern of farm families(`./farm)

Sr.No.	Particulars	Farming system I (Crops only)			Farming system II (Crops + Livestock)			Farming system III (Crops + Livestock + Hort.)		
		Irrigated	**Rainfed**	**Overall**	**Irrigated**	**Rainfed**	**Overall**	**Irrigated**	**Rainfed**	**Overall**
1.	Crop Production	57,933.43 (65.42)	32457.37 (68.26)	45195.40 (66.41)	88350.76 (54.56)	60178.93 (45.31)	74264.85 (50.39)	49650.15 (14.45)	26378.54 (12.65)	38014.34 (13.77)
2.	Horticulture Production	-	-	-	-	-	-	182737.34 (53.20)	112748.85 (54.05)	147743.10 (53.52)
3.	Dairy (Milk/Manures etc.)	1545 (1.75)	1661.32 (3.49)	1603.16 (2.36)	70197.41 (43.35)	65159.93 (49.06)	67678.67 (45.93)	101362.89 (29.51)	66115.44 (31.69)	83739.17 (30.34)
4.	Poultry/Goats	-	-	-	215.93 (0.13)	1526.00 (1.15)	870.97 (0.59)	2193.98 (0.64)	1024.10 (0.49)	1609.04 (0.58)
Farm business income		**59,478.43 (67.17)**	**34,118.69 (71.75)**	**46,798.56 (68.77)**	**158764.10 (98.04)**	**126864.86 (95.52)**	**142814.48 (96.91)**	**335944.36 (97.80)**	**206266.93 (98.88)**	**271105.65 (98.21)**
5.	**Other Sources**									
	a)Wages	3471.67 (3.92)	6415.21 (13.49)	4943.44 (7.26)	3166.67 (1.96)	5951.17 (4.48)	4558.92 (3.09)	-	2333.33 (1.12)	1166.67 (0.42)
	b)Business/ Services	25600.00 (28.91)	7018.47 (14.76)	16309.24 (23.97)	-	-	-	7545.98 (2.20)	-	3772.99 (1.37)
Income from other sources		**29071.67 (32.83)**	**13433.68 (28.25)**	**21,252.68 (31.23)**	**3166.67 (1.96)**	**5951.17 (4.48)**	**4558.92 (3.09)**	**7545.98 (2.20)**	**2333.33 (1.12)**	**4939.66 (1.79)**
Total income		**88550 (100.00)**	**47,552 (100.00)**	**68051 (100.00)**	**161931 (100.00)**	**132816 (100.00)**	**147373 (100.00)**	**343490 (100.00)**	**208600 (100.00)**	**276045 (100.00)**

(Figures in the parentheses are the percentages to the total)

At the overall level, the total income of the farmfamilies was `.68,051, `.1,47,373 and ` 2,76, 045 in farming system- I,II and III, respectively. At the overall level, in farming system- I, of the total income, 66.41 per cent income was from crop production, 2.36 per cent from dung value of draught animals, i.e.68.77 per cent income from farm business and in the case of other than the farm business income, 23.97 per cent from business / service and 7.26 was per cent from wage earnings. The total income of irrigated and rainfed region of farming system- I worked to`. 88,550 and`.47,552, respectively. In irrigated region, the income was near about double than the rainfed region, owing to more irrigation facilities in irrigated region, with more proportion of commercial crops (Sugarcane, fodder crops, wheat, summer groundnut etc.)

At the overall level in farming system II, it was observed that out of the total income, 50.39 per cent income came from crop production, while 45.93 per cent was from dairy and 0.59 per cent from poultry, thus 96.91 per cent income was from farm business and other than the farm business income was only 3.09 per cent from wage earning at the overall level. Higher income was from farm business activity owing to combined effect of crop production activity with dairy enterprise. The total income of irrigated and rainfed region of farming system- II worked to`. 1, 61,931 and `.1, 32,816, respectively. Out of the total income of irrigated region, 54.56 per cent income was from crop production, 43.35 per cent income from livestock and 0.13 per cent income from poultry. Thus, 98.04 per cent income was from farm business activity while the other than farm business income was 1.96 per cent (wage earnings). In rainfed region, 45.31 per cent income was from crop production, 49.06 per cent income from livestock and 1.15 per cent income from poultry. As such, 95.52 per cent income was from farm business activity and from other than farm business, the income was 4.48 per cent (wage earnings). It indicated that there is higher total income in irrigated region than rainfed region. The income derived from livestock was more than crop production income in rainfed region. It is due to lack of irrigation facility (19.55 per cent) resulting in lower crop production income as compared to irrigated region. Farmers only alternative is to go for livestock rearing and hence the more income from that activity.

At the overall level, in farming system- III, out of the total income, 13.77 per cent income was from crop production, 53.52 per cent from horticultural crops, 30.34 per cent from livestock and 0.58 per cent from poultry. Thus, 98.21 per cent income was from farm business activity, while other than farm business income was 1.79 per cent (wage earnings and service / business). The total income of irrigated and rainfed region of the sample farms of farming system III worked to `. 3, 43,490 and `.2, 08,600, respectively.

The difference between the farming systems indicated that the total income in farming system- II was double than the farming system- I, while total income of farming system -III was fourfold than that of farming system- I. The total income from farming system I (crop production activity) was very less as compared to farming system- II and III. The sourcewise income indicated that the more than 50 per cent income was derived from crop production in farming system- I and II, while in farming system- III, more than 50 per cent income was derived from horticulture and in the farming system- I, 31.23 per cent income was derived from other than farm business activity but in farming system-II and III, correspondingly, just 3.09 and 1.79 per cent income was derived from other than farm business activity. This has indicated that farming system-I, depends more on other than farm business activity as compared to farming system-II and III.

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Expenditure pattern: The per farm annual expenditure of sample farmers is depicted in Table 6 in next page

Table 6Expenditure pattern of sample farmers. (`./farm)

Sr. No.	Particulars	Farming system I (Crops only)			Farming system II (Crops + Livestock)			Farming system III (Crops + Livestock + Horticulture)		
		Irrigated	Rainfed	Overall	Irrigated	Rainfed	Overall	Irrigated	Rainfed	Overall
1.	Crop production	43057.60 (69.19)	30494.73 (64.31)	36,776.17 (67.08)	73,275.18 (50.08)	44328.99 (35.02)	58802.09 (43.09)	33406.67 (14.64)	23901.86 (12.38)	28654.27 (13.60)
2.	Livestock /Poultry	2501.86 (4.02)	2726.86 (5.75)	2614.36 (4.77)	31171.90 (21.31)	57734.25 (45.60)	44453.08 (32.58)	54357.51 (23.82)	37778.28 (19.57)	46067.90 (21.87)
3.	Horticulture	-	-	-	-	-	-	69,757.10 (30.57)	91056.13 (47.17)	80406.62 (38.18)
Farm expenditure		**45559.46 (73.21)**	**33221.59 (70.06)**	**39390.53 (71.85)**	**104447.08 (71.39)**	**102063.24 (80.62)**	**103255.16 (75.67)**	**157521.28 (69.03)**	**152736.27 (79.12)**	**155128.78 (73.65)**
4.	A. Foods (Food grains,Oils Vegetables, etc.)	4972.34 (7.99)	4214.30 (8.89)	4593.32 (8.38)	9898.17 (6.77)	7594.01 (6.00)	8746.09 (6.41)	11006.32 (4.82)	9395.50 (4.87)	10200.91 (4.84)
	B. Milks and milk products	3315.00 (5.33)	3036.10 (6.40)	3175.55 (5.79)	4935.67 (3.37)	3873.33 (3.06)	4404.50 (3.23)	6511.68 (2.85)	4673.33 (2.42)	5592.51 (2.60)
	C. Others (Clothing, Medical, Education, Repayment of loan etc.)	8382.67 (13.47)	6945.21 (14.65)	7663.94 (13.98)	27025.88 (18.47)	13069.34 (10.32)	20047.61 (14.69)	53154.34 (23.29)	26235.40 (13.59)	39694.87 (18.85)
Family expenditure		**16,670.01 (26.79)**	**14195.61 (29.94)**	**15432.81 (28.15)**	**41859.72 (28.61)**	**24536.68 (19.38)**	**33198.20 (24.33)**	**70672.34 (30.97)**	**40304.23 (20.88)**	**55488.29 (26.35)**
5.	**Total expenditure (Farm + family)**	**62,229 (100.00)**	**47417 (100.00)**	**54823 (100.00)**	**146307 (100.00)**	**126600 (100.00)**	**136453 (100.00)**	**228194 (100.00)**	**193041 (100.00)**	**210617 (100.00)**

At the overall level, the per farm total expenditure of the sample farms were `.54,823 ,`.1,36,453 and `..2,10,617,in farming systems-I,II and III, respectively. Out of that more than 70 per cent was the farm expenditure in all the three farming systems. The expenditure on crop production was the major expenditure in farming system-I and II, while expenditure on horticulture was major expenditure in farming system-III. The regionwise total expenditure was more in irrigated region than the rainfed region. The family expenditure of the sample farmers were `.15, 433, `. 33,198 and `.55, 488.

In farming system-I, the expenditure on the crop production was the major and it alone accounted for 69.19 per cent and 64.31 per cent expenditure to the total annual expenditure in irrigated and rainfed regions, respectively. In farming system II, also the crop production. activity shared the major expenditure and it alone accounted 50.08 per cent in irrigated region but in rainfed region farmers concentrated more on livestock activity, so the major expenditure was on livestock which was 45.60 per cent. But in farming system-III, the major expenditure was on horticulture, which was 30.57 per cent and 47.17 per cent in irrigated and rainfed regions, respectively.

Sustainable income of different farming systems: Economic sustainability depends on profitable enterprises, family saving and the family debt. Therefore, the sustainable farm income means the annual income from farm activities which meets the annual expenditure of farm and family and remains surplus to the farm family for saving or repayment of debt. (Preston S.,2003). Therefore, for sustainable farm income, the farm expenditure and family expenditure were deducted from the total farm business income. The sustainable income of different farming systems were worked out and presented in Table 7

At the overall level, it was observed that the sustainable farm income of farming system-II and III were `.6, 361 and `.60, 489. But farming system-I could not meet their requirements on the basis of their farm business income i.e. income from crop production activity alone. They experienced a deficit of `.8, 025. The farmers in farming system-II and III from both the regions have an economic surplus. It means farmers in farming system-II and III were having sustainable farm income whereas more sustainable farm income was observed in farming system III. After adding the income from other sources, the non sustainable farm income of farming system-I became sustainable and came to `.13, 228 and it removed the economic deficit. The income from other sources (wages, services and business etc.) was the only factor, which helped them to sustain. In farming system-II and III, the sustainable farm income came to `.10, 920 and `.65,428, respectively. These farming systems seemed to have more of an economic surplus Regionwise sustainable farm income indicated that, in irrigated region, the sustainable farm incomes of farming system-II and III were `.12,457and `.1,07,751, while in rainfed region, sustainable farm income were `.264.94 and `.13,226 in farming system-II and III ,respectively. But farming system-I of irrigated and rainfed region could not meet their requirements on the basis of their farm business income i.e. income from crop production activity alone. They experienced a deficit of `.2751 and `.13, 299, respectively. The farmers of farming system-II and III of both the regions have surplus. It means farmers of farming system-II and III of both regions were having sustainable farm income, more sustainable farm income was in farming system-III of irrigated region and less in farming system-II of rainfed region. But the farming system I was not having sustainable farm income.

After adding the income from other sources, farmers in farming system-I, had sustainable farm income, which was `.26, 321 in irrigated region and `.135.17 in rainfed region. Therefore, it removed the economic deficit. The income from other sources (wages, service and business etc.) was the only factor, which helped them to become sustainable. The income from crop production activity can not meet the total expenditure of farm family. Thus, the income from crop production activity alone was not enough and sustainable as compared to other farming systems.

Table 7Sustainable income of sample farmers (`./farm)

Sr. No.	Particulars	Farming system I (Crops only)			Farming system II (Crops + Livestock)			Farming system III (Crops +Livestock+Horticulture)		
		Irrigated	Rainfed	Overall	Irrigated	Rainfed	Overall	Irrigated	Rainfed	Overall
1	Total farm business income	59478.43	34118.69	46,798.56	158764.10	126864.86	142814.48	335944.36	206266.92	271105.64
2	Total expenditure (Farm +Family expenditure)	62229.47	47417.20	54823.10	146306.80	126599.92	136453.36	228193.62	193040.50	210617.06
3	**Sustainable farm income from farm business**	**-2751.04**	**-13298.51**	**-8024.54**	**12457.30**	**264.94**	**6361.12**	**107750.74**	**13226.42**	**60488.58**
4	Income from other sources	29071.67	13433.68	21252.68	3166.67	5951.17	4558.92	7545.98	2333.33	4939.66
5	**Sustainable income from total income**	**26,321**	**135.17**	**13228**	**15624**	**6216**	**10920**	**115297**	**15560**	**65428**

Conclusions: Farmers of farming system-I, do not get adequate employment through crop production activity throughout the year. They get just 30 per cent employment out of the 365 days of the year. Therefore, farmers were required to find the employment in alternative activities in order to earn additional income. But in farming system-II and III, about 70 and 84 per cent employment was generated.

The total income of the farming system-II was double than the farming system I, while total income of farming system-III was four times more of the farming system- I. This indicated that farming system- I, need to depend more in other than farm business activity as compared to farming system- II and III.

In both irrigated and rainfed region, the farming system III was more profitable than the farming system- I and II, also all the farming systems of irrigated regions were more profitable than rainfed region.In farming system-I, the expenditure on the crop production was the major expenditure item in the total annual expenditure in irrigated and rainfed regions. In farming system- II, the crop production activity was also the major expenditure item in irrigated region but in rainfed region, since farmers concentrated on livestock activity so it become the major expenditure item. But in farming system-III, the major expenditure was on horticultural activity in both irrigated and rainfed regions.

All the farming systems of irrigated as well as rainfed region were economically viable, while farming systems of irrigated region were more economically viable than farming systems of rainfed region. The total expenditure which included family expenditure and farm expenditure, the farming system- I, could not meet their requirements on farm business income i.e. income from crop production activity alone in both the regions. But the farmers of farming system- II and III of both the regions seemed to have an economic surplus. This indicated that the farmers of farming system- II and III of both regions were having sustainable farm income. After accounting the income from other sources, farmers of farming system-I could manage the economic deficit. The income from other sources (wages, service and business etc.) was the only factor, which helped them to sustain in both the regions.

Policy implications:

i) Farmers in dry land region be motivated to cultivate dry land fruit crops alongwith livestock for sustainable farm income. Farmers in irrigated region should be motivated to undertake cash crops, horticultural crops and livestock for enhancing their income and employment on farms.
ii) For efficient use of available irrigation, it is necessary to provide subsidy for micro-irrigation sets, farm ponds on wider scale to bring more area under irrigation which will result in higher employment and income to the farmers.
iii) To avoid exploitation in marketing of agriculture produce, Government should strengthen the existing infrastructure and provide the cold storage, processing facility and implement the market model act effectively.

The technical know-how, the availability of inputs, diversification of crops and activities, just and efficient use of irrigation and better marketing

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Dr.J.T.Dorge, Dr.D.B.Yadav /Department of Agril.Economics/Mahatma Phule Krishi Vidyapeeth/
Rahuri-413 722/Dist:Ahmednagar(M.S.)