Western Experience With the Costs and Benefits of Organic Agriculture

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I will first discuss the definition of organic agriculture, give a survey of its relative quantitative importance, and then present excerpts from the four most relevant studies available.

The definition of organic agriculture

The terms organic, biological, ecological, and alternative agriculture are used as synonyms here. One might also say environmentally beneficial, environmentally compatible, or sustainable indefinitely. In English-speaking countries, the term organic is used most frequently.

Organic agriculture is a method, a technology, a system. It is agronomy plus applied ecology. The U. S. Department of Agriculture defines it as follows: "Organic farming is a production system which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators, and livestock feed additives. To the maximum extent feasible, organic farming systems rely upon crop rotations, crop residues, animal manures, legumes, green manures, off-farm organic wastes, mechanical cultivation, mineral-bearing rocks, and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients, and to control insects, weeds, and other pests."

This is expressed in the written rules /Richlinien, Cahiers de charges/ which all major organic movements have developed. Some are more strict than others, such as the biodynamic method. Since no western country protects the use of the term and its meaning, except France, there are a number of organizations and farms which pay only lip service to the concept, whereas in reality they practise some form of integrated farming. Integrated farming is a step in the direction of organic farming, but it is not recognized as organic by the International Federation of Organic Farming Movements /IFOAM/ or any of its members. IFOAM developed a definition of the minimum that can still be called organic agriculture. It is a set of rules too long to present here.

Organic agriculture also is a particular attitude. Most organic farmers agree that rules alone will not be sufficient in practical farm life, because not all the problems encountered in practical organic farming are covered by rules. In these cases, the attitude must be one of active environmental conservation.

Our short definition therefore is: "Agronomy, plus applied ecology, plus active environmental conservation."

Frequently, organic farming is also called an ideology. Most organic farmers, however, deny this. There are some, however, who practise ecological farming like an ideology. Generally these farmers are deeply committed to what they are doing and achieve good results. There is no necessity, however, to make an ideology out of it.

The relative quantitative importance

Ecological farming in the modern sense exists in all western countries. Table 1 lists the approximate total number of farms and total organically farmed surface per country, in order of decreasing "organic farmer density", the latter being the number of organic farmers divided by the number of inhabitants. Switzerland happens to be at the head of the list.

If the "organic area density" had been taken as the criterion, i.e. the total number of hectares divided by number of inhabitants, then the sequence would be as follows: USA, France, Switzerland, Austria, Sweden, Denmark, Federal Republic of Germany, the Netherlands, Great Britain.

Other countries with sizeable organic areas in the modern sense are Australia, Canada, and New Zealand.

Applying a loose definition of organic agriculture /non-use of chemicals and synthetic fertilizers, systematic recycling of many organic wastes into compost/, then about 80% of China, demographically the largest country in the world, farms organically. The 20 remaining percent is the so-called "modern" sector of Chinese agriculture, an unfortunate term, because it implies that 80% are "old-fashioned" and scheduled to disappear. It should not be disregarded that China solved its famine problem in the organic way, and from an ecological point of view, its organic sector is more advanced than its modern sector because it is better able to be sustained indefinitely. It would be possible to modernize the organic sector without recourse to environmentally damaging chemical and industrial methods. Unfortunately, China is modernizing its agriculture by imitating all the ecological mistakes that chemical and industrial farming made elsewhere.

Applying an even looser definition /non-use of chemicals and synthetic fertilizer/, it is possible to claim most of the Third World's agricultural

Table 1

Number of organic farms and total organic area per country

Country	Farms	Hectares	Sources
Switzerland	1000	11,800	FAT, 1983
USA	24000 ?	/700,000?/	USDA, 1980
France	5000	/100,000?/	LAIRON, 1983
Austria	500	/5,500?/	PLAKOLM, 1983
Sweden	300	4,000	PETTERSSON, 1983
Denmark	150	2,000	VESTER, 1983
The Netherlands	350	3,000	BOERINGA, 1983
FRG	/800?/	14,000	KRAUTH/LÜNZER, 1982
Great Britain	/300?/	/3,000?/	/ / = estimates

area as being "organic". Albania, and Tanzania, for instance, would be farming organically /in Tanzania, JULIUS NYERERE even exhorts his ministers to apply modern organic methods/. In reality, however, such a loose definition is not meaningful, because it is quite possible to destroy entire landscapes without chemicals and synthetic fertilizers; in fact, this has been done. Destruction of a landscape, however, proves that the methods applied were not ecological, but sustainable for a long time, but exploitative, environmentally destructive.

Coming back to the industrialized western countries, and applying the IFOAM definition, it is possible to say that the total organically farmed area in those countries is less than one percent of their total agricultural area.

The largest single organic farms known in western countries are a grain and sheep farm in Western Australia /5,000 ha/, a 570 hectare ranch in Texas, and an area of 139 ha farmed biodynamically by the city of Vienna, Austria, the latter being the largest organic farm close to Hungary, and the largest in Austria. In England, there is an organic farm of about 500 ha.

The four studies relevant to the topic

The following is a brief summary of the four main sources of data presented in the rest of this paper:

1. A comparative Swiss Government Study, giving economic data for a statistically-representative sample of farms for the three years 1979 to 1981. The comparison is between 26 organic and 26 comparable conventional farms engaged in mixed production. The average size of the organic farms is 12 ha, typical for Swiss conditions. Each organic farm is compared to a "partner" conventional farm similarly situated and structured. In addition, the data for other conventional farms are given under the heading "Test Group". All these farms have the same accounting system, supervised by government authorities.

2. A comparative Missouri Study, worked out by a team from Washington University in St. Louis, Missouri, USA, and covering the three years 1974 to 1976. Fourteen "pairs" of comparable farms in the Mid-West are compared, as in the Swiss study, each farm being larger than 40 ha. The animal-raising sectors of these farms were omitted; only crop production was considered. In addition, data from a supplementary survey of 258 organic farms were studied.

3. City of Vienna data: Austria's largest farmer is the City of Vienna, with 2089 hectares, of which 139 are farmed biodynamically, but without cattle. Grains and vegetables were grown, and data given for the years 1980 to 1983. This is not a comparative study.

4. West Australian Survey: Data are available from an analysis of 248 questionnaires returned to the University of Western Australia by organic farmers. In addition, 18 farms returning questionnaires were visited by a research team in order to verify the data.

Swiss Government Study: Excerpts /Tables 2-4/

This comparison shows organic wheat yields to be somewhat lower, prices higher, operating costs considerably lower, and production returns /in Swiss Francs per hectare/ 15% higher. To a lesser degree, this pattern repeats it-

Table 2

Yields, and production returns in organic and conventional farms, 1979-1981

A. Wheat, barley and potatoes

	Unit	Wheat			Barley			Potatoes		
		Organic farms	"Partner" conventional farms	Test group	Organic farms	"Partner" conventional farms	Test group	Organic farms	"Partner" conventional farms	Test group
Number of farms		10	10	1,506	7	7	1,582	8	8	621
Yields/area	dt/ha	38.8	45.1	47.0	38.8	45.0	45.0	316.9	308.8	363.0
Prices/ton	Fr/dt	110.9	98.5	98.9	67.3	64.3	66.0	37.8	37.8	30.6
Sales/area	Fr/ha	4,898	4,592	4,812	3,753	3,861	4,104	12,404	11,938	11,288
Operating costs	Fr/ha	631	890	956	362	709	669	2,025	2,982	2,874
Production returns	Fr/ha	4,267 +15%	3,702	3,896	3,391 +7.5%	3,152	3,435	10,379 +16%	8,956	8,414

B. Dairy cattle

	Unit	Organic farms	"Partner" conventional farms	Test group
Number of farms		26	26	1,465
Yields/cow	l/cow	4,517	5,111	4,912
Milk price/liter	Fr/l	0.87	0.8	--
Milk sales*/ cattle unit	Fr/CU	2,572	2,461	2,428
Operating costs	Fr/CU	498	537	598
Production returns	Fr/CU	2,813	2,859	2,660

C. Cattle, and feed area combined

	Unit	Organic farms	"Partner" conventional farms	Test group
Number of farms		26	26	264
Main feed area/farm	a	1,145	1,149	1,002
Animals/farm	head	21.72	24.2	24.2
Feed area/animal	a	53	48	41
Milk/main feed area	l/ha	8,609	10,669	11,254
Sales/area	Fr/ha	6,654	7,680	8,289
Operating costs	Fr/ha	1,391	1,854	2,300
Production returns	Fr/ha	5,268 -10%	5,826	5,989

* without calf milk

self in barley production. Yields of potatoes, however, were better on organic farms, compared to their partners; not better, however, than the large number of other conventional farms having dissimilar structures and conditions. Since prices were about equal, and operation results again substantially lower, organic potato production showed 16% better production returns /Table 2/A./.

Milk production is the most important source of revenue for most Swiss farmers. Table 2/B. shows yields per cow and year to be somewhat lower on organic farms, milk sales, however, slightly higher, operating costs lower, and production returns roughly equal. What the table does not show is the interesting fact that milk yields per cow life are substantially higher on organic farms, for the simple reason that "organic" cows live much longer than conventionally-treated ones.

This is only partly expressed in the lower operating costs. Another fact behind the figures is that the government so far has prevented organic raw milk, which is in very high demand, from reaching more than a tiny part of the market. When it does reach the market, very high prices are paid for it. Those prices would increase production returns considerably in favor of organic farm incomes. Starting in 1984, government regulation of milk has been relaxed somewhat, allowing more frequent sales of raw organic milk directly to consumers. This will result in a substantial improvement of the economic situation of many organic milk producers. Conventional milk producers may also now sell raw milk to consumers, however, the demand for conventional raw milk is slight. People want raw milk from the healthiest cows, and they figure that cows living much longer and less stressed to give maximum annual yields are healthier.

Table 2/C compares the performance of the dairy sector per area unit, rather than per cow unit. Organic farms, true to their ecological approach, try to be friendlier to their animals, and allow them a larger grazing or feed area than their conventional colleagues. This results in a higher percentage of roughage /the true food for ruminants/, and a higher percentage of farm-grown feed. It also results in lower costs, and in lower milk production per hectare. Since organic milk prices were only insignificantly higher in those years, due to government regulation, organic sales per hectare are significantly lower, too. As usual, organic operating costs are lower, but not as much lower as to prevent production returns per hectare from being lower, too.

Summing up the figures on yields, sales, and production returns, the following pattern emerges:

The organic farms frequently, but not always, had slightly lower yields but consistently lower costs. They generally achieved somewhat higher unit prices, except in milk, where government regulation prevented prices from following demand. As a result, organic production returns were moderately higher, except in dairying, where they were equal on a per cow basis, but moderately lower on a per hectare basis. Lower per hectare returns in dairying was due to larger feed or grazing areas being allotted to each cow.

A general remark on yield comparisons might be in order here. Throughout the world, farmers and agronomists talk about yields, and mean yields on a fresh-weight basis. The somewhat lower organic yields are interpreted as a kind of inferiority of organic farming. However, when yields are compared on a dry matter basis, the organic yields are about equal, and in some cases higher, as some studies have found /SCHUPHAN, 1974/. This means that organic products generally contain less water, and are therefore more nourishing. Unfortunately, relevant statistics are very sparse. If more existed,

and this fact were better known outside organic circles, the general misinterpretation of yield comparisons would disappear. In terms of dry matter yields, or "nourishing units", if such a thing existed, the world has nothing to fear from ecological farming. It should fear water-inflated products, because they are more perishable, and less nourishing.

In Table 3 the comparisons of costs and benefits per hectare are extended to not operating profits. From the economic point of view, these are more meaningful than yield comparisons. In terms of both cash flow, and not

Table 3

Comparison of total economic results
/averages 1979-1981, Francs/hectare/

	Organic farms	"Partner" conventional farms	Test group
Number of organic farms	21	21	1,030
Sales of crops	2,105	2,053	2,321
+ Milk animal sales	5,559	6,182	6,021
+ Other sales	604	473	490
= Total sales per ha	8,268	8,708	8,932
Less:			
- Crop costs	366	665	737
- Animal costs	1,328	1,387	1,492
- Equipment costs	1,269	1,440	1,367
- General costs	268	260	245
= Cash flow per ha	5,037	4,956	5,088
Less:			
- Building maintenance amortization, land improvement	533	448	485
- Interest and rent paid interest on capital invested	1,012	1,027	1,036
= Net operating profit per hectare	3,492	3,481	3,567

operating profit, organic farms achieve results no different from others. What does differ is the structure of costs and income. Considerably lower total costs in organic farming is the most salient feature in this structural difference. This makes organic farms less dependent on outside credit - an advantage of the first order, especially in difficult times, both from the micro- and the macro-economic point of view. Per hectare figures are more relevant than per farm figures when large and small agricultural areas or units are compared. From per-farm figures not presented here, the Swiss Government study found that organic farmers' families achieve higher net pro-

fits per year, but work longer hours. Therefore, they achieve lower net profits per work day. The farms stated that the main reasons for working longer hours were, that farming this way was more pleasant, and that more side activities were possible /receiving visitors, and customers, giving interviews and courses, etc./, which cost hours, but also earn additional income.

Summing up, the organic farms in the Swiss Government study showed strengths and weaknesses, from a purely economic point of view /Table 4/.

Table 4

Economic strengths and weaknesses of organic farming

Strengths	Weaknesses
Lower costs for: - fertilizer - chemicals - auxiliary substances - machinery - hired labor	More work hours More land per animal
Better yields in bad weather	Lower yields with many products
Better resistance of crops	Lack of special machinery
Longer cattle life	Lack of special seeds
Better public demand for products	No help from government
Higher prices for some products	No help from farmers' associations
Greater product diversity /better risk distribution/	
More self-reliance and independence from outside sources	

The Missouri Study: Excerpts

This study provided the model, on which the Swiss study was based and improved. Fourteen Midwestern farm "pairs" were compared, each pair consisting of one organic and one comparable conventional farm. Only their crop production is reported; animals and permanent pastures were excluded. Fixed costs were also excluded, because they were about the same in both groups. The years are 1974-1976.

The average size of the organic farm in this study was 172 hectares, of which 59% was in crops. For the conventional farms, the respective figures were 194 hectares, and 73% in crops. The latter were selected for above-average performance, which somewhat slants the comparisons in disfavor of the organic farms.

The market price of the crops in both groups was purposely assumed to be equal. This again slightly disfavors organic farms, because their products generally fetch higher prices. With this in mind, the following summary of sales, costs, and returns should be interesting:

Organic, compared to conventional:	Dollars/hectare:
Market value /"Sales", in equal prices/	11% lower
Operating costs	38% lower
Crop production returns /Market value less Operating costs/	equal

Yields were compared also /Table 5/. While organic yields ranged below or above county averages in a less than conclusive manner, they tended to be somewhat lower than their conventional partners' yields. Interestingly, organic yields showed a tendency to be better than conventional ones in poor weather, but lower in good weather.

Table 5

Yield comparisons

Crops	Organic yield in t/ha, compared to	
	"Partner" conventional farms	County average
Corn /maize/	- 7%	- 5%
Soybeans	- 6%	+12%
Wheat	-23%	-14%
Oats	equal	+11%

The authors of the Missouri Study also measured energy intensiveness of organic and conventional farms, expressed as fossil energy consumed per dollar value of crop produced. They found that organic farms were only 40% as energy intensive as their partners. The main reason is non-use of synthetic fertilizer and pesticides. From this derives an economic benefit: more independence from petroleum prices and supplies, more stability.

Soil loss was 34% less on organic farms, when equal tillage practices were assumed. This assumption, however, does not reflect reality: organic farms in the Midwest typically use chisel ploughs, instead of moldboard ploughs. Chisel ploughs cause less erosion.

Soil fertility: the organically managed fields showed clearly higher organic carbon and total nitrogen levels, as well as slightly higher levels of available phosphorus /+15%/ and exchangeable potassium /+11%/.

City of Vienna biodynamic crop area

Closer to Hungary, the capital city of Austria grows 139 hectares of cereals and vegetables by the biodynamic method, one of the methods of organic farming. This is a test area among the 2089 hectares that Vienna cultivates agriculturally. The test started in 1975 and completed its first cycle in 1984, without cattle or other animals. Vienna's "Magistrats-Abteilung 49", which manages the organic fields, was asking the following questions:

- how feasible is this method, without animals, on a large scale, and in the Pannonic climate?
- what yields are possible?

- what quality?
- marketing possibilities?
- what economic results can be achieved?

A four-year crop rotation was selected, which is shown below:

Year	Crop sequence	Area, ha
1	Winter barley	20
	Winter rape	10
	with Green manure	28
	Red beets	2
2	Winter wheat with Persian clover underseed	30
3	Potatoes	15
	Carrots	5
	Root celery	3
	Onions	3
	Cabbage	4
4	Summer dry wheat	10
	Summer wheat	10
	Oats	10

Vienna says that yields were satisfactory, quality excellent in cereals as well as in over 20 vegetables, and that the overall results are very encouraging /Table 6/. Labor costs in vegetables were found to be higher, which will lead to a streamlining of the number of vegetable types, and varieties. The only problem encountered was in marketing, and this will be solved. Vienna now plans to expand its biodynamic area, and to start a new phase, based on these experiences.

Table 6

Cereals production

	Yield, dt/ha			Sales, Shilling/ha		
	Organic farms	Conventional farms	O/C	Organic farms	Conventional farms	O/C
Winter wheat						
1980	50.7	43.8	+16%	33,283	15,418	+103%
1981	28	36.5	-23%	18,200	14,283	+27%
1982	41.8	43.6	-4%	26,527	17,726	+50%
1983	34.1	46.1	-26%	22,362	18,913	+18%
Winter barley						
1980	28	31.6	-12%	16,582	9,578	+73%
1981	26.9	26.5	+2%	14,812	8,150	+82%
1982	39.5	37.3	+6%	21,540	11,902	+81%
1983	31.2	37.2	-16%	16,951	11,786	+44%

The West Australian Survey

The following tables were put together by researchers from the University of Western Australia on the basis of 248 questionnaires returned by organic farmers. Subsequently, 18 of the farms were visited.

As to yields, the picture does not show a clear trend. Perhaps it is possible to conclude that many organic farmers experienced an initial drop in yields, but did not notice any drastic changes overall /Table 7 and 8/. Meat and milk producers tended to be pessimistic, vegetable and fruit growers to be more optimistic.

Table 7

Answers to question: "Was there an initial drop in yields after converting to organic farming methods?"

Farm type	Yes	No	No change	Don't know/ not answered
Grains/sheep	5	0	6	8
Beef/dairy/pigs	6	0	1	2
Horticulture/market gardens/orchards/ vineyards	3	1	2	0
Total	14	1	9	10

Table 8

Yield comparison

Farm type	Yields obtained by organic methods compared with those obtained by							
	previous conventional methods				conventional methods on neighbouring farms assessed by the organic farmers			
	higher	same	lower	don't know/ too early	higher	same	lower	don't know/ too early
Grains/sheep	4	1	5	9	7	8	6	9
Beef/dairy/sheep	1	1	4	3	0	2	2	7
Horticulture/market gardens/orchards/ vineyards	2	1	1	2	8	2	2	4
Total	7	3	10	14	15	12	10	20

In contrast, trends in economic performance were very clear: costs were unanimously lower, and net return /profitability/ better than before, with few exceptions /Tables 9 and 10/.

In the arid climate of Australia, water is a crucial factor in agriculture. Long and frequent droughts plague farming in most areas. Therefore, the fact that most organic farmers noticed less severe effects of droughts, compared to their conventional neighbours, is very encouraging /Table 11/.

Table 9

Organic farmers' assessments of the economic performance in comparison with conventional neighbours

Costs			Gross returns			Net returns		
same	less	higher	same	less	higher	same	less	higher
17	0	0	3	6	1	2	5	5

Table 10

Change in profitability since conversion from conventional to organic farming practices

Better	Same	Worse	Don't know/ /too early	Total
12	3	5	14	34

Table 11

Effects of droughts on organic farmers compared with their conventional neighbours

No problems/ not drought area/ irrigated	Don't know/ no data/ no comparable farmers	Less severe	Same	More severe	Total
11	12	22	4	1	50

Better performance of the soil during drought periods is closely linked to its structure and humus content. One of ecological farming's main goals is to improve precisely this: soil structure and humus content, also called natural fertility. Therefore, it comes as no surprise that the Australian organic farmers' response to the question "Has soil fertility improved?" was a clear "yes", expressed in different ways, as shown in Table 12.

Table 12

Responses to question: "Has soil fertility improved?"

Comment	No. of responses
No	1
Difficult to assess	1
Soil test shows poor soil	1
Too early	3
No data	4
"Yes" /without elaboration/	14
Better vegetative cover, yields	9
Increased worms	9
More ant life	1
Increased root depth	2
Increased depth of topsoil; soil darker in colour;"more friable"; "improved texture"; "improved structure"; "like a damp sponge"; "looks better"; improved pH; hardpan gone	13

Economic performance of organic agriculture in general

Based on the studies presented here, and on others not mentioned, it is possible to note certain tendencies which repeat themselves worldwide, under very different conditions. These tendencies are an extreme simplification of reality, but nevertheless may claim some significance /Table 13/.

Table 13

Simplified schematic summary of organic agriculture's economic performance, compared to conventional agriculture, in industrialized countries

Input	Output
total costs: clearly lower	yields: comparable or slightly lower farm prices: slightly higher
	= sales volume: about equal
Profits: slightly higher	

Macro-economic aspects

The term "economic" covers two different points of view: the farm management's /micro/, and an entire population's /macro/. Usually, the micro level is meant. Input and output factors on the micro level by definition are restricted to those factors which cause the monetary profit of the economic unit to rise or fall. So far we compared such "internal" factors in organic and conventional farms, and more or less disregarded costs and benefits external to the micro level. No discussion of ecological farming would be complete, however, if it did not at least mention that external costs and benefits also exist, from the population's or nation's point of view. It is precisely these external factors which are leading to the spread of organic farming the world over. Macro-economics considers a larger part of reality, and is therefore more relevant for the overall assessment of a farming system, than micro-economics alone. In other words, governments should study organic farming on the macro-economic level, including external costs caused by farms under the conventional and organic systems, and external benefits produced by both kinds of farms. This is a very difficult undertaking because of the problems involved in trying to

Table 14

Which agriculture is better for the economy?

Input	+	output factors	Industrial farming	Ecological farming
Internal factors	+	farm sales volume	$ X	$ X,
	-	farm costs	$ Y	$ Y,
	=	farm profit/loss	$ Z	$ Z;
External factors	-	external costs caused by farm	$ and phys. units	$ and phys. units
	+	external benefits produced by farm	$ and phys. units	$ and phys. units
Macro-economic profitability	=	profit or loss for the economy	$ and phys. units	$ and phys. units

Examples of external costs caused by farms:

fossil fuels:	- contribution to depletion
	- contribution to pollution
soil:	- degradation /quality loss/
	- erosion /quantity loss/
water:	- eutrophication /N, P/
	- biocide pollution
wildlife and flora:	- loss of habitat
	- loss of species
landscape:	- loss of recreational value
human health:	- chronic and acute poisonings
	- reduced nutrition value of food

measure external factors in monetary units. Some ecologists have proposed energy units, rather than monetary ones, which would allow a better quantitative understanding of ecosystems, including farming systems, but which would not be meaningful to economic planners, trained in thinking in monetary units. Therefore, using crude monetary units for evaluating external factors is still a more practical approach to measuring macro-economic profitability of farming systems.

Even without recourse to evaluations and figures, it becomes apparent from the schematic table /Table 14/ that ecological farming leads to a better macro-economic profitability than conventional farming, because it systematically tries to reduce many external costs, and increase many external benefits.

Nutritional aspects

Last but not least, a glance at a particularly important "external factor" might be in order: nutritional food value. From the research so far conducted, it appears that the nutritional quality of organically grown raw food products is better /Table 15/. This type of quality is influenced more heavily by the kind and method of fertilization used rather than by biocides, or absence of biocides. Leaving aside synthetic fertilizer alone will not always produce better nutritional food quality, because a negative influence on crop metabolism can also come from anaerobic liquid manure, or from heating systems. Advanced organic farmers avoid these.

Table 15

Positive /+/ or negative /-/ influence of organic fertilizer on nutrient content of crops, compared to synthetic fertilization /SCHUPHAN, 1974/

Desirable substances			Undesirable substances	
Dry substance		+ 23%	Nitrate N	- 93%
Relative protein content		+ 18%	Free amino acids	- 42%
Ascorbic acid /Vitamin C/		+ 28%	Sodium	- 12%
Total sugar		+ 19%		
Methionine		+ 23%		
Trace minerals:	K	+ 18%		
	Ca	+ 10%		
	P	+ 13%		
	Fe	+ 77%		

Summary

Western experience with the costs and benefits of organic, or ecological agriculture in the modern sense is a hopeful one. Some organic farms now have existed for over 50 years. Presently, thousands of organic farms exist.

Organic agriculture tries to be, in a short formula: Agronomy, plus Ecology, plus Environmental Conservation.

These goals are more ambitious, and more difficult to reach, than the goals of conventional agriculture. And these goals are in the public inter-

est. It is therefore a piece of good news to be able to report that organic agriculture, in spite of its different structure of inputs and outputs, is economically viable. With good farm managers, it can even be flourishing.

The total organic area is still too small to make much difference in the worldwide tide of environmental deterioration. However, ecological agriculture is now coming to the attention of more and more governments, because ever larger sections of the public sense its usefulness and its healing effect, and ask that it become the rule, rather than the exception.

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