Original Research

Competitiveness of Milk Production: Global Scenario

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Abstract

The dairy world today can be depicted as globally connected, composite and fast-changing over the last two decades as the milk production has expanded by a yearly average compound growth rate of almost 2 per cent. In 2013, milk ranked third by production and was the top agricultural commodity in value terms worldwide (FAOSTAT, 2016). This paper analyses the competitiveness of milk production in the major milk producer countries in the world. As far as farm structure is concerned, the number of farms in the world has shown a decreasing trend since 2013. The average cost of milk production only at world level has decreased significantly since 2013. In the case of total cost analysis among major countries, New Zealand had the lowest cost but when returns were considered then only Brazil and India were able to cover the total economic cost. Other farms had positive farm income when all direct subsidies were considered, except like a few countries in Germany and China. While some countries like the US were able to cover cash cost but they were not able to cover the total economic cost when opportunity cost was also included, which pose a question in the long-term competitiveness of these countries.

Key words: Competitiveness, Dairy, Farm Structure, Globally, Global Milk Production, IFCN
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Introduction

The world dairy market has undergone considerable structural changes over the last two decades as the milk production has expanded by an annual average compound growth rate of almost 2 per cent. In 2013, with a total production of 770 billion litres valued at USD 328 billion, milk ranked third by production tonnage and was the top agricultural commodity in value terms globally (FAOSTAT[1], 2016). In 2006 the global milk production was 677 MT which has reached to 851 MT in 2016 (IFCN Dairy Report[2], 2017). Along with augmented supply, rapid economic growth, population expansion, increased urbanization etc. have

also boosted up the demand for dairy products. Furthermore, dairying is important for food security in many developing countries including India as it is a chief source of income and food for a greater part of the rural poor (FAO, 2011). Above half of the world's total milk production has been originated in the developing countries such as India but still the milk yield per cow is less than other countries. In India, dairying has been considered as one of the activities aimed at alleviating poverty and unemployment particularly in the rural areas in the rain-fed and drought-prone regions. Moreover, this sector is crucial for reducing income inequalities. The progress in this sector results in a more balanced development of the rural economy (FAO[3], 2009). Thus, the dairy sector has vast scope for improving economic and in turn, the nutritional status of rural people. The increasing importance of dairy to the world economy increases the importance of competitiveness among the countries. Globalization, trade liberalization and advancement in transportation and communication give rise to an outstanding acceleration of market competition. Competition guarantees consumers to have a variety of goods and services to choose from. It leads to introduction of new products, further adding to choose, and a better standard of living. It can also help encourage lower prices and lower fluctuations too.

As stated in Table 1 in 2016, milk production of 851 million-ton ECM (Energy Corrected milk) was produced by around 120 million dairy farms keeping 378 million milking cows and buffaloes. This means that the world's average farmer keeps 3.2 milk animals with an average annual milk yield of approximately 2.2-ton ECM/animal/year. There is a wide disparity of dairy farms in the world ranging from less than 3 cows per farm in some countries to over 1,000 cows per farm in others which shows that milk production is performed distinctively in different countries. The dairy farming systems differ significantly in terms of farm size, housing, milking and feeding systems. Due to these huge discrepancies, it becomes essential to compare among the major milk producing regions.

Table 1: Dairy world in 2016 compared with 2006

Description	Units	Annual Values		% Change Over 2006	
		2006	2016	Absolute	%
Milk Production	MT	677	851	174	25.70
No. of milk animals	Million head	329	378	49	14.89
Average milk yield	t/head/yr	2	2.20	0.20	10
Farm number	Million	118	120	2.00	1.69
Average farm size	Head/farm	2.80	3.20	0.40	14.29
Daily consumption/ capita	Kg/capita/year	103	115	12	11.6

Source: IFCN Dairy Report, 2017

This paper tries to analyze various global scenarios of the dairy sector which will help us to measure the degree of global competition among the leading milk producing countries and to assess the performance of the top countries in the global market.

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Farm Structure

The farm structure of a country is crucial in determining the social dimension of its dairy sector. It consists of the number of dairy farms (cows and buffaloes) in each country of the world.

Dairy Farm Number

After a continuing growth of global dairy farm numbers by 1.8 per cent yearly, increasing 1998 from 95.4 (1998) million to 125 million farms (2013), afterwards, the farm number started decreasing and in that year it decreased by 1.8 per cent and by 1.6 per cent in 2015 and in 2016 it reached 119.6 million in which India contributes for more than 61 per cent (73 million) of the farms followed by Pakistan (7 million).

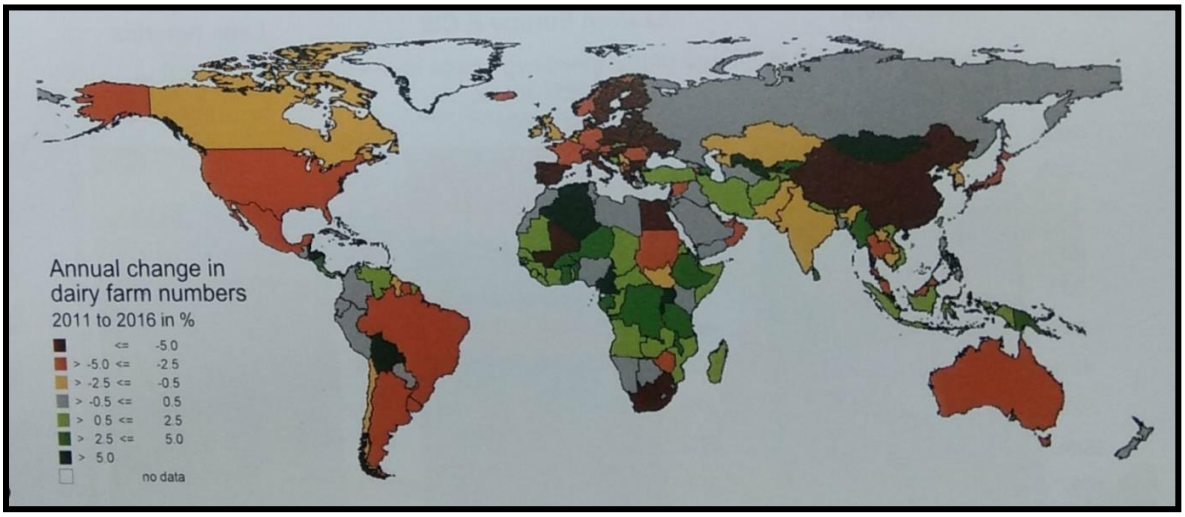

Fig. 1: Annual change in number of dairy farms (2011-2016) (*Source: IFCN Dairy Report, 2017*)

According to Fig.1, within the last 5 years, China has the largest decrease (41 per cent) in number of farms as many smallholders in China gave up dairy farming. In European Union this decrease was 27 per cent which shows the continuing consolidation process. As far as typical farm size is concerned, it has increased by 1.7 per cent annually since 2011 and reached 3.1 animals per farm in 2016. North America has the highest increase (4.7 per cent annually) since 2011 reaching average farm size of 179.6 dairy animals per farm (Fig.2).

Average Herd Size

The Fig. 2 shows the number of milk animals per farm in various regions of the world in 2016. Most of the farms in Africa and Asia and a few farms in Latin America generally have a herd size of less than 10 animals per farm. In Asia the average farm size found was 1.9 cows per farm which shows the dominance of smallholder household farms with dairying as subsidiary occupation. These are the subsistence farms or small-scale farms. On the other hand, countries with average farm size more than 100 cows per farm were

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the United States of America, United Kingdom, Denmark, New Zealand, Argentina, Australia, Saudi Arabia, South Africa and Israel. The highest average herd size was registered in Oceania where New Zealand has more than 400 cows per farm followed by South Africa with more than 360 cows per farm and Australia with more than 280 cows per farm. These countries have pastoral scheme which is run on low production cost and enables milk to be produced according to world market conditions. Furthermore, a continuous increase in herd size in the previous years has enabled them to realize economies of scale.

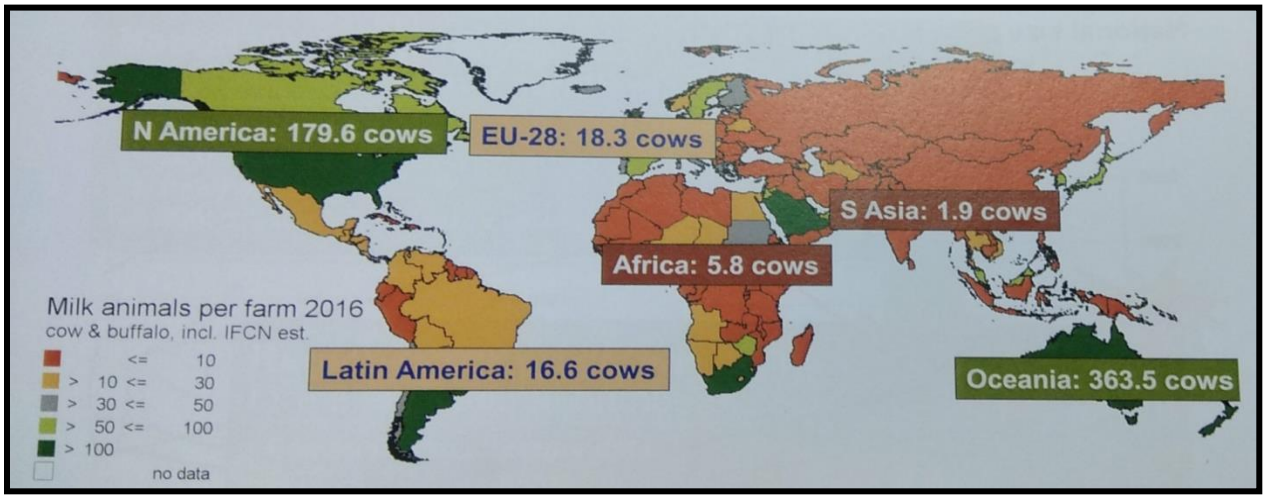

Fig. 2: Average herd size in different regions of the world (2016) *(Source: IFCN Dairy Report, 2017)*

The comparison among the farm structure of major milk producing countries in the world is shown in Table 2. The farms vary in terms of ownership, herd size and the intensity of milk production. India has continued to remain the world's largest milk producer with 170.89 million ton of ECM (Energy Corrected Milk) which accounts for about 20 per cent of the milk produced in the world. But the milk is mostly produced in dairy households with an average farm size of 2 animals. India has more than 73 million farms involved in milk production.

Table 2: Dairy farm structure and milk production comparison of major countries (2016)

Description	Unit	India	USA	Germany	China	New Zealand	Brazil
Dairy farm no.	in 1000's	73083	46	69	1300	12	1015
Average farm size	cows/ farm	1.80	203	61	3.80	419	212
Production	Mill T ECM	170.89	92.3	33.48	32.08	24.21	34.23
No. of milk animals	in 1000's	131207	9328	4218	5000	4998	21477
Milk Yield	(t/cow/year)	1.30	9.90	7.90	6.40	4.80	1.60
Annual change (2011-16)							
Dairy farm no.	%	-0.80	-4.90	-4.50	-10	0.30	-2.70
Average farm size	%	3.20	5.40	4.90	4.60	1.70	1.20

Source: IFCN Dairy Report, 2017

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In spite of the highest milk production, the average milk yield is as low as 1.3-ton ECM per cow per year. India is growing its milk production at a faster pace of 2.3 per cent annual growth rate for the last 5 years. However, this growth is mostly coming from the increasing number of farms. Conversely, there has been a declining trend in number of farms in USA and other countries on account of consolidation. For the same reason the average farm size of these countries has increased in the last five years. The average farm size was highest for New Zealand followed by USA which mainly consists of business farms. In case milk yield per cow, the USA was found to have the highest productivity among all major countries i.e. 9.9 tons/cow/year followed by Germany (7.9 tons/cow/year).

Cost of Milk Production on Average Sized Farms (2016)

It is the key cost component of the dairy enterprise. It shows the competitiveness of milk production of a region when compared to another region or country. There are two approaches to evaluate the competitiveness i.e. cost leadership and product differentiation. To recognize advantages in competitiveness, the enterprise can use one or both of these strategies but in present case as milk is a homogenous commodity, cost leadership approach is considered more common. It means that the regions which produce milk at lower cost and have a higher profit are more competitive. Here competitiveness depends on production cost (technology and prices for inputs) and prices for milk and other returns. Fig. 3 shows the cost of milk production in various regions of the country. The cost was found in the range of 12 USD/ 100 Kg ECM in extensive farming systems in Uganda where beef is the major output and milk is a side product to 167 USD/ 100 Kg ECM for Switzerland where the feed prices are very high. This huge variation can be ascribed to regional disparities in feed cost, labour cost and other maintenance cost of different breeds across regions.

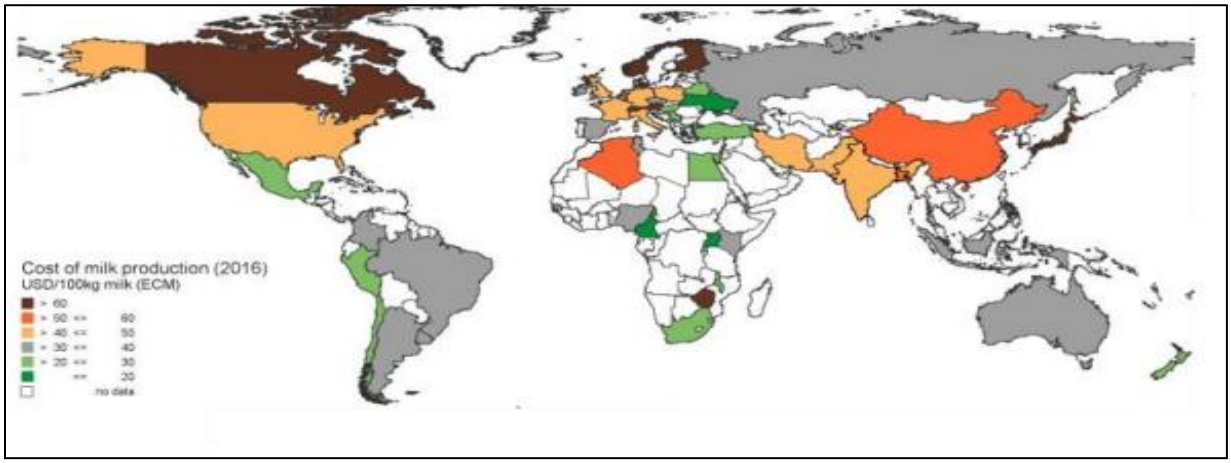

Fig. 3: Cost of milk production on average sized farms for 2016 (USD/ 100 kg ECM) *(Source: Hemme, 2016/17)*

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The average cost analyzed over all countries was 38.4 USD/ 100 Kg ECM. The regions which fall in the range of 40-50 USD/ 100 Kg ECM were Western Europe, North America and Asia. The Mid East and Latin America had average cost levels between 30-40 USD/ 100 Kg ECM while cost in Africa, CEEC and Oceania alter between 20-30 USD/ 100 Kg ECM. The low-cost regions were some farms in South America; Central and Eastern Africa. The cost of well managed farms in Western Europe was found in the range of 30-55 USD. While in case of the North America the cost of large farms varied between 26 USD/ 100 kg ECM for Idaho to 40 USD/ 100 kg ECM for New York. In India, the cost was in the range of 40 to 50 USD/ 100 Kg ECM. In Oceania cost remained stable in Australia (32 USD) but decreased for New Zealand which reached 28 USD/ 100 kg ECM.

It is very important to outline the average cost movements of typical farms in major countries over a period of time in order to identify the factors behind the competitiveness of milk production. It also enables to take a view on the levels of cost of milk production so as to sustain milk supply levels and prices in the short and medium run. Hence, in this part of the paper, we have compared cost trends of average farms from the six major milk producing nations viz. Germany, USA, New Zealand, India, China and Brazil (Fig.4 & 5).

Germany (DE-139N)

This farm type stands for an average farm in Northern Germany which represents 25 per cent of the farms and 45 per cent of cows in the country. The farm has raised from 68 cows in 2000 to 139 cows in 2016 at an average annual growth rate of 5.7 per cent. In the year 2000, the cost was 28 USD/100 kg milk and increased up to 2006 reaching 42 USD per 100 kg milk in 2006. The reason behind the cost increase was appreciation of the Euro (+36 per cent) and moderate increase of cost in Euro term. After that from 2008 to 2012, the cost depicted a declining trend towards 40 USD per 100 kg milk. The main reason was devaluation of the Euro by 14 per cent. But in 2014, the cost increased again to 50 USD due to higher feed and energy prices and labour cost in Euro terms. In 2015, there was a decrease to 40 USD per 100 kg milk as a result of the depreciation of the Euro and it still decreased to 37 USD per 100 kg milk in 2016. The cost in 2016 covers the world milk price level.

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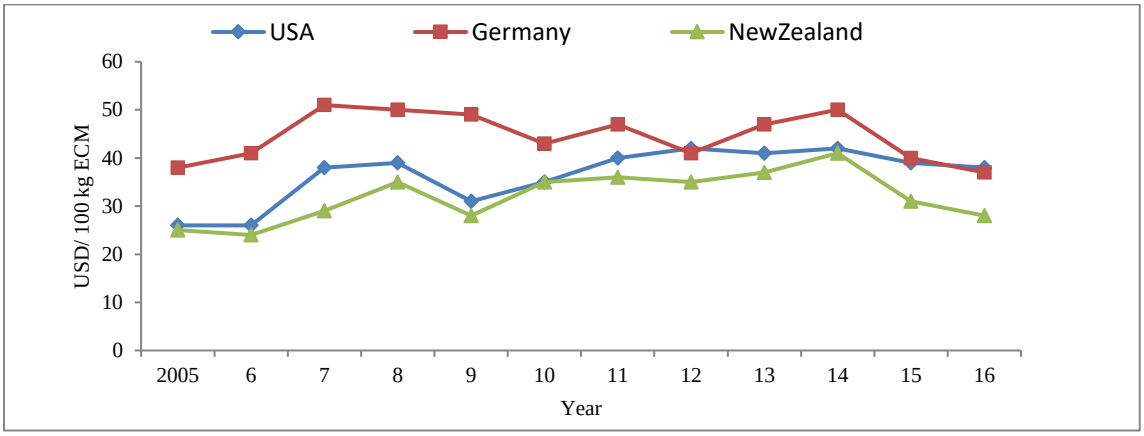

Fig. 4: Cost of milk production developments in major countries (2000– 2016)

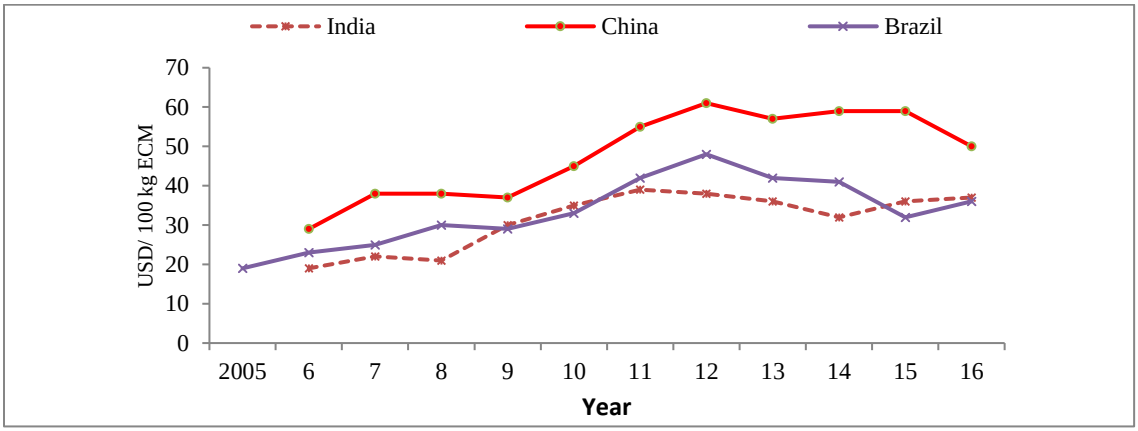

Fig. 5: Cost of milk production developments in major countries (2000– 2016)

USA (US-500WI)

This farm type is a larger family farm in the range of 200-1000 cows which forms about 24 per cent of the cows in the USA. In the US, cost was relatively stable from 2000 to 2006 as inflation determined change of input prices was compensated by increasing milk yields. But the increasing feed prices had direct impact on these farms and cost, which increased by 50 per cent to a level of 38.5 USD per 100 kg milk in the year 2007 and 2008. After this there was a sharp drop in cost in 2009 which was due to result of very low milk prices, in response of which farmers started cutting cost wherever possible. But then again cost started rising until the year 2012 mainly due to high feed prices - towards 44 USD per 100 kg milk. The cost remained between 40 and 45 USD per 100 kg milk for the last five years. But in last year (2016) the cost dropped to 38 USD per 100 kg milk because of falling feed prices in the US. The cost in 2016 covers the world milk price level.

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New Zealand (NZ-349)

The typical farm representing an average sized farm covers about 45 per cent of the farms and 68 per cent of the cows in New Zealand. This dairy farming system was a world leader in cost competitive milk production in the year 2000 i.e. 12 USD per 100 kg milk, which was the lowest cost level in those days. But because of increase in input prices and appreciation of the currency, cost increased to a level of 40 USD per 100 kg milk in 2014 and again decreased to 30 USD in 2015 and 2016. This decrease was based on a depreciation of the NZD against the USD and because of cost saving measures on farm. The cost in 2016 covers the world milk price level.

China (CN 200BE)

This typical farm represents 30 to 40per cent of the farms and is a larger farm type in China in the range of 200-500 cows. Since 2006, a strong increase in cost due to the appreciation of the Yuan was seen. In 2012, the Yuan had gained value by + 25 per cent to the USD compared to 2000. The cost on Chinese farms did not drop sharply in 2009 as was observed in most other countries, because the drop-in prices in national currency was almost fully compensated by the appreciation of the Yuan. In 2010, cost of production has increased to about 60 USD per 100 kg milk because of rising feed prices. But in 2016 it decreased to 50 USD per 100 kg milk. Although farms decreased cost substantially in 2016 as compared to previous years, this farm seems to be least cost competitive as the cost was above the world milk price level.

India (IN-20N)

This farm denotes a larger family farm type in India in the range of 5-35 cows, currently representing 3 per cent of the farms and 15per cent of the cows. However, it contributes a large proportion of the milk delivered to the processor. The herd size has been fluctuating between 18-22 cows. The production cost showed a permanent upward trend until 2011. The main drivers were increasing feed and land prices as well as the extraordinary rise in wages. This increase stopped in 2012 as rising input cost was compensated by a higher milk yield per cow and a depreciation of the currency. In the last two years, cost per 100 kg milk increased again, mainly because of rising feed cost and salaries. The cost in 2016 covers the world milk price level which was 38 USD per 100 kg milk.

Total Cost and Returns from Milk Production

In the previous part, production cost for major countries were shown exclusively for milk production. In that case all the countries except China were able to produce milk at a cost below average world milk price level. But a dairy farm usually has various other costs as well as other sources of income. The total economic cost of dairy enterprise includes cash cost, depreciation and opportunity cost. If the opportunity cost of owned resources are not included in the cash cost calculation the analysis will tell about the future

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competitiveness valid in the short to medium term only. In longer term, adjustment within the sectors will be a reality which will be dependent on relative resource use. Hence, total economic cost which includes imputed charges for owned resources were considered to examine the longer-term outlook for the competitiveness of the sector. The various sources of income are milk returns, cattle returns, coupled and decoupled subsidies out of which milk and cattle sales form the major portion. Some proportion of dairy revenue is also generated through manures or surplus feed. In some countries, particularly in European Union, a significant part of income comes from subsidies. In some farms like India, New Zealand, Germany, and the USA which are major milk producing countries, the non-milk returns are lowest. Also, in India, the beef is banned in most of the states. The major income source in these farms is returns from selling milk. In such a case the price of milk plays a substantial role in determining the returns from the milk. On the other hand, high non milk returns i.e. high cattle returns were found in Algeria, Turkey, Bangladesh and some parts of African countries while high subsidies were paid in high cost countries in Western Europe and China. The world milk price in 2016 decreased by 1 USD/ 100 kg ECM and reached 27 USD/ 100 kg ECM.

Fig. 6 shows that cash cost per unit of milk production are reasonably positive for all the countries. China dairying had by far the highest cash cost (and also the highest total economic cost) due to high feed cost followed by total economic cost in Brazil. Farms in the US, Germany and India also had relatively higher total economic cost, with total cost being somewhat lower for farms in New Zealand. The same can be said for cash cost in these countries where these countries have more cash cost as compared to the New Zealand. However, average sized typical farms in New Zealand exhibited the strongest competitive position in 2016 in medium as well as in long term as they exhibited lower total economic cost compared to other countries.

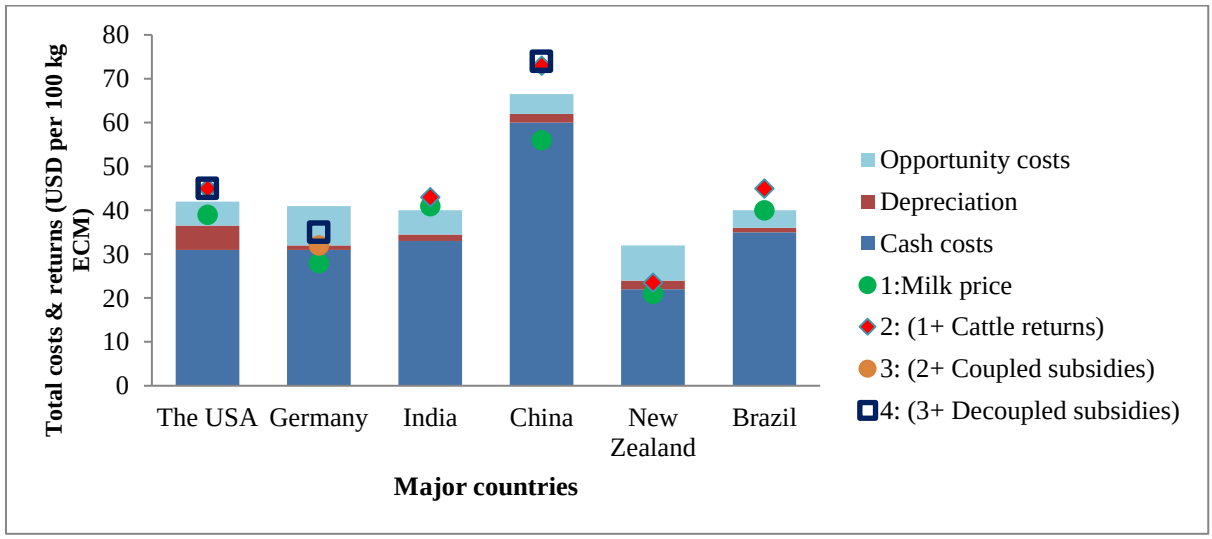

Fig. 6: Total cost and returns of dairy enterprise in major countries (2016) *(Source: Author's own calculation from IFCN Dairy Report, 2017)*

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But along with cost, returns from the dairy enterprise are also important component to compare the competitiveness among farms. So, in case of returns, there were only two countries i.e. India and Brazil where the price of milk was greater than total economic cost per unit milk which shows its competitiveness among all other countries and they were also able to earn positive entrepreneurial profit. In the USA though the milk prices were able to cover cash cost but failed to cover total economic cost which shows the US was competitive only in short term and its competitiveness eroded in long term. On the other hand, in Germany, the milk prices were not even able to cover cash cost. However, with the help of non-milk returns and subsidies, Germany was able to cover the cash cost but still total economic cost was not covered by it, which depicts its low competitiveness. The same was the case with China in which milk prices were not able to cover cash cost but with the help of subsidies it was able to not only cover cash cost but also total economic cost easily. This shows the importance of subsidies in the US, China and Germany, otherwise they would generate a negative farm income. Surprisingly, given low relative cost in the dairy farms in New Zealand, the average typical farms did not show a positive margin over total economic cost. Also, the milk prices were not able to cover the cash cost in New Zealand which makes it less competitive in spite of the lower total economic cost. With the help of non-milk returns, it was at least able to cover the cash cost.

Conclusion

There has been a gradual shift down in cost of milk production towards the 35 - 40 USD/100 kg ECM mark since 2012 in the major milk producing countries. This clearly indicates market supply corrections and stabilization in prices in the medium and long run. There is wide variability in productivity and economic cost levels. Dairy development takes place in every country at different levels as they have huge variations in farm structure (number of dairy farms, average farm size etc.), cost and returns from the dairy enterprise. In case of farm structure, India had highest milk production in the world because of highest bovine population in the world. But at the same time the milk yield level in India was very low as compared to other countries like the US, Germany and China. A declining trend was seen in number of farms in most of the countries because of consolidation. The variation in cost of milk production can be attributed to regional variations in feed cost, labour cost and other maintenance cost of different breeds across regions. In case of time series analysis of cost of milk production of major countries, it was seen that the cost increased up to 2013 thereafter exhibited declining trend. While in case of total cost analysis among major countries, New Zealand was found as most competitive as it had the smallest cost compared to other countries but when returns were considered then Brazil followed by India were found as most competitive. All the other countries highly depended on coupled subsidies to cover the total economic cost owing to low milk returns. These findings could be considered as warning signals for their future competitiveness.

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