ASPECTS OF CONFORMITY QUALITY ASSESSMENT OF FOOD FORTIFICATION PROJECT UNDER IPS (INTEGRATED PROGRAMME STRATEGY) PROJECT

Dissertation
At
GAIN, Jaipur

By
Khem Singh Beniwal

Under the guidance of
Dr. Alok Kumar Mathur

MBA Hospital & Health Management
2013–15

Institute of Health Management Research
Jaipur
2015

INSTITUTE OF HEALTH
MANAGEMENT RESEARCH
(WHO Collaborating Centre for District Health System Based on Primary Health Care)

IIHMR UNIVERSITY

TO WHOMSOEVER MAY CONCERN

This is to certify that Khem Singh Beniwalstudent of MBA Hospital and Health Management from IIHMR University, Jaipur has undergone internship training at GAIN, Jaipur from March 18, 2015 to May 18, 2015.

The Candidate has successfully carried out the study designated to him during internship training and his approach to the study has been sincere, scientific and analytical.
The Internship is in fulfillment of the course requirements.
I wish him all success in all his future endeavors.

Dr . (Col) Ashok Kaushik
Dean, Academics and Student Affairs
IIHMR, Jaipur

Dr. AlokMathur
Associate Professor
IIHMR, Jaipur

18/5/2015

1, Prabhu Dayal Marg, Near Sanganer Airport, Jaipur- 302029, Rajasthan, India.
Ph.: 0141- 3924700, 2791431- 32, Fax: 0141- 3924738, E-mail: iihmr@iihmr.org, Web.: www.iihmr.org

INSTITUTE OF HEALTH MANAGEMENT RESEARCH, JAIPUR
1, Prabhu Dayal Marg, Near Sanganer Airport, Jaipur-302029, INDIA
Ph.: +91-141-3924700 (30 Lines)
Fax : +91-141-3924738
E-mail: pmu.ips@iihmr.org
URL : http://www.iihmr.org

Date: May 18, 2015

TO WHOM IT MAY CONCERN

It is certified that Dr. Khem Raj Beniwal, student of PGDHM, Institute of Health Management & Research (IIHMR), Jaipur, has completed his dissertation w.e.f. 18th Mar 2015 to 18th May 2015 under Food Fortification Project-Integrated Programme Strategy, Rajasthan at IIHMR, Jaipur. He has worked on "Aspects of conformity Quality Assessment of Food Fortification Project". He worked effectively for the dissertation and we wish him luck for his future.

Rahul Sharma
Project Director
Food Fortification Project

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "Aspects of conformity Quality Assessment of Food Fortification Project" and submitted by Khem Singh Beniwal Enrollment No. 1452 under the supervision of Dr. AlokMathurfor award of MBA Hospital and Health Management of the university carried out during the period from March 08, 2015 to May 18, 2015embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Signature

1, Prabhu Dayal Marg, Near Sanganer Airport, Jaipur- 302029, Rajasthan, India.
Ph.: 0141- 3924700, 2791431- 32, Fax: 0141- 3924738, E-mail: iihmr@iihmr.org, Web.: www.iihmr.org

ACKNOWLEDGEMENT

The success of any task would be incomplete without the expression of gratitude to the people who made it possible. I express sincere gratitude towards everyone who helped directly or indirectly in completion of my Dissertation from IPS Project Rajasthan.

At the onset of my report, I would like to acknowledge my sincere thanks to our University, IIHMR, Jaipur for providing me platform to gain enough knowledge and skills in different aspects of health management.

I express my gratitude and regards to my Guide Dr. Alok Mathur for able guidance and useful suggestions which helped me in completing the project work

Special thanks to our Project Director Rahul Sharma for the faith shown upon me and guidance given without which the assignment would not have been possible.

I would like to thank Project Officer Dr. Ranjeeta and staff of GAIN for their help at various stages of my project.

I would also like to thank my institution and faculty members without whom this project would have been a distant reality. My seniors and colleagues also hold a special mention here for believing in me and supporting me throughout Dissertation.

CONTENTS

List of Tables-

List of Figures-

1 ABOUT THE ORGANIZATION-

1.1 –GAIN (Global Alliance for Improved Nutrition)-

GAIN is supporting technically and financially to IPS Project. The GAIN is an international organization that was launched at the UN in 2002 to engage in the human suffering caused by malnutrition[i].

1.02- Integrated Programme Strategy-

The project was launched in February 2010, fortified wheat flour and oil was launched for open market by Shri Parasadi Lal Meena, Honorable Minister of Food and Civil Supplies, Govt. of Rajasthan.

It refers to "integrating" multiple food vehicles like wheat flour, oil, milk to be delivered through different delivery channels commercial open market and public funded programs such as the ICDS, MDM and PDS through a project based model for fortification of these foods with iron, folic acid, vitamin B12 and Vitamin A[ii].

IIHMR has signed a Grant Agreement as the Executing Agency to implement the food fortification project under the Integrated Program Strategy with Global Alliance for Improved Nutrition (GAIN). The project is being carried forward with a multi-sectoral partnership with the Government of Rajasthan, the civil society and the private sector.

The various components within the project:
1. Production and Distribution (P&D)
2. Monitoring and Evaluation
3.Legislation and Quality Control (LQC)
4.Project Management Unit (PMU)
5. Social Marketing and Communication (SMC)

1.3-Goal-

To improve the micronutrient status of general population especially children, pregnant and nursing mothers through large scale staple food fortification in the State of Rajasthan.

1.4-Objective-

Generally, to reduce micronutrient malnutrition in the State of Rajasthan by making available fortified wheat flour, oil milk and soydalanalogue through both the open market and government distribution channels.

1.5-Specific Objectives of the project-

- To introduce fortified wheat flour, oil and milk through commercial channel to reach the general population
- To increase regular consumption of fortified foods among target groups

- To demonstrate the technical and operational feasibility of introducing fortified foods through Midday Meal scheme and Integrated Child Development Services Scheme

1.6-Project Implementation Strategy-

As a first step to the project, it was critical to identify and select food vehicles which could lead to project success. After a lot of research and analysis of food habits, following three food vehicles, namely, wheat flour, oil and milk were identified.

Wheat Flour

Wheat is a major staple food in Rajasthan. It accounts for 7.8 percent of the total area under wheat production and around 8.3 percent of the wheat production among the major wheat producing states. The estimated food grain production of Rajasthan is 173 lakh tones, of which share of wheat production is nearly 77 lakh tones.

Oil

Rajasthan is the 3rd largest oilseed producing state with a share of 15.1 percent of the total oil production in the country. Rapeseed-mustard and groundnut are the two principal oilseed crop raised in the state. Rajasthan is ranked 1st in production of rapeseed-mustard. In Rajasthan, the total production of oilseeds is around 52 lac tones, which is 15 percent of the total production of nine oil seeds in the country. The per capita consumption of edible oils in Rajasthan, as reported by a senior member of Rajasthan Oil Association, is 10 kilograms per person per year. Mustard oil is the most preferred oil consumed by 53 percent of the rural and 44 percent of the urban households. Consumption of groundnut oil is higher in urban households as compared to rural ones. The average approximate consumption of edible oils in Rajasthan should be around fifty thousand tons per annum, around 50 percent of which is produced within the state.

Milk

Total milk production in Rajasthan is around 95.36 lac tons, which is around 9 percent of the total milk produced in the country. Per capita availability of milk is 408 grams per day, which is substantially higher than the national average of 252 grams per day. Per capita monthly consumption of milk in Rajasthan is 9.5 Kgs in rural areas and 7.4 Kgs in urban areas.

1.7-(IPS) Integrated Programme Strategy Project Synopsis-

This is a population based project which seeks to provide access to fortified staple food products both through open market and government distribution channels such as the Public Distribution System. In addition the project is providing nutritious fortified meals to children through the Mid-Day Meal scheme and the Integrated Child Development Services. This project is unique as it address micronutrient deficiency through an approach that integrates multiple food vehicles, diverse distribution channels and different micronutrients. A strong quality assurance and control system and effective social marketing and

communication activities will support and enable sustained demand amongst the community for nutrient dense food, especially through public food based programs.

1.8-The project seeks to-

1. Reduce the prevalence of anemia and vitamin A deficiency by 30% in the target population
2. Increase the availability of fortified wheat, oil and milk through the organized sectors in the state from nil to 90% and increase the consumption by the population from nil to 30%.
3. Demonstrate the technical and operational feasibility of introducing fortified foods through Mid-Day Meal Scheme and the Integrated Child Development Services Project.

1.9-Collaboration with Government-

The project is working in close collaboration with:

1. Department of Women and Child Development, Government of Rajasthan –for policy support, supply chain management and overall supervision of provision of fortified food to the Integrated Child Development Scheme.

2. Department of Mid-Day Meal, Ministry of Panchayati Raj and Rural Development, Government of Rajasthan – for policy support, supply chain management and overall supervision of fortified food provided through the Mid-Day meal programme.

3. Department of Food and Civil Supplies, Government of Rajasthan – for policy support, supply chain management and overall supervision of fortification of wheat flour provided through the Public Distribution System[iii].

2. About Fortification and Premix –

2.1-Food Fortification-

According to WHO Food Fortification defined as the addition of one or more essential nutrients to a food, whether or not it is normally contained in the food, for the purpose of preventing or correcting a demonstrated deficiency of one or more nutrients in the population or specific population groups.[iv]

2.2-Restoration –

Means the addition to a food of essential nutrients which are lost during the course of Good Manufacturing Process (GMP), or during normal storage and handling procedures, in amounts which will result in the presence in the food of the levels of the nutrients present in the edible portion of the food before processing, storage or handling[v]

2.3-Enrichment -

Defined as the restoration of vitamins and minerals lost during processing[vi]

2.4-Wheat Flour Fortifications ratio–

Iron- 30 mg per kg

Folic Acid- .030mg per kg

Vitamin B-12 -.001 mg per kg

2.5-Wheat Flour Testing conformity Range–

Wheat Flour – 27- 33 per kg

2.6-Oil Fortifications ratio –

Vitamin A- 25 IU/ gm

Vitamin D – 2 IU/ gm

2.7-Oil Testing conformity Range –

(22.5 to 27.5 IU/gm)

2.8-Milk Fortifications ratio-

Vitamin A- 2 IU/ ml

Vitamin D – .4 IU/ ml

2.9-Milk Testing conformity Range –

(0.8to 2.2 IU /ml)

2.10-Premix-

The most common flour fortification practice is to add multiple vitamins and minerals using a single ingredient called a premix.

Liquid premix is use In fortification of milk and oil. Powder premix is use in fortification of wheat flour.

2.11-Premix includes-

- Fortificants (powdered vitamins and minerals)
- Excipients (carriers, fillers)
- Free-flow agent Premix may have a yellow or green color. This does not affect the color of flour because premix is added in such small amounts. [vii]

2.12-Premix Benefits-

- Easier to test
- Single feeder, check and adjustment
- Easier to feed
- Provides uniform nutrient distribution
- Single ingredient tracer possible
- Less expensive than buying individual nutrients

Individual nutrients, such as these pictured, are more difficult to add to flour than a single premix with a blend of the required nutrients.

2.13-Premix Storage-

In the Warehouse:

- Readily accessible
- Not Exposed to:
    - Sunlight
    - Excessive Heat
    - Moisture
    - Damage or Theft
- First-In-First-Out (FIFO)[viii]

3.-LITERATURE REVIEW –

3.1-Malnutrition Status of India and Rajasthan-

Micronutrient deficiencies and anaemia are common in India. As per the National Family Health Survey (NFHS-3) report, nearly seven in ten children aged 6-35 months are anaemic. It is also estimated that 62 percent of children under five years of age have subclinical vitamin A deficiency (serum retinol <0.7 µmol/l). Rajasthan has a high prevalence of anemia: 79.1 percent among children 6-35 months, 53.8 percent among ever-married women, and 61.7 percent among pregnant women; 44 percent children under 3 years are underweight, and more than one-third are stunted. The incidence of Neural Tube Defects due to folic acid deficiency is also very high (18per 1000 live births). Rajasthan has the second lower most vitamin A supplementation coverage, with only 16.4 percent of 12-35 month olds having received a Vitamin A supplement in the six months prior to the NFHS-3. Almost 30 percent of all new-borns are of low birth weight. Various assessments indicated a comparatively high proportion in grade III and grade IV categories of malnutrition. This is just a glimpse of the various levels of deficiencies afflicting the state of Rajasthan which makes it required to take up a fortification initiative. [ix]

3.2-Monitor for Quality & Impact-

If quality measures are followed regularly, results are analyzed, and problems are improved, fortification will have the extreme health effect. The process includes food control and program monitoring.

Food control includes:

- Internal: Flour millers use procedures such as recording the use of premix and conducting iron spot tests to provide quality checks.
- External: Government authorities (such as food safety inspectors) test products at mills periodically to ensure that fortification meets the country's specifications.
- Commercial: Food safety inspectors check retail stores to be sure the fortified product is in the marketplace.[x]

3.3- Effectively-

A key to effective implementation is to engage millers at the beginning of the country's fortification discussions. Industry leaders can help ensure that recommended standards will be feasible to implement. National milling associations can be instrumental in implementing national scale fortification and making sure that the effort is sustainable.

Establishing processes for quality control is also an important part of effective implementation.

To add vitamins and minerals to industrially milled wheat or maize flour, millers use the same technical process they use to add ingredients to improve dough handling or increase

shelf life. Consequently modern millers are familiar with the equipment and expertise needed for fortification.

3.4-The Flour Millers' Tool Kit offers suggestions for-

- Procuring premix (the combination of vitamins and minerals added to flour in the milling process)
- Setting up the mill
- Operating the fortification systems
- Assuring quality control[xi]

3.5- Flours-

In the fortification of flour the necessary nutrient mixture is mixed with appropriate diluents to produce a premix, which is then accurately metered into the flour. The addition of vitamins B_1 and B_2, Niacin, Iron and Calcium to wheat flour is a common practice in many developed countries. It is technologically possible to add other vitamins and minerals as well. The first comprised vitamin A, Pyridoxine, Folic Acid, Tocopherol Acetate, Thiamine, Riboflavin, Niacin and Iron while the second contained Calcium, Magnesium and Zinc.

The vitamin/iron premix established excellent stability on storage. The flour enriched with both premixes also demonstrated excellent stability on storage at room temperature. Under conditions of accelerated storage at elevated temperature (45 °C), however, there was substantial loss of vitamin A beyond 4 weeks of storage. Parrish et al. (1980) also reported good stability of enriched wheat flour stored at room temperature, but about 50% losses in flour stored at 40 °C for 6 months.[xii]

3.6-Milk-

The production of a large proportion of milk on the market involves the removal of cream. Along with the cream, much of the fat soluble vitamins are also removed. Addition of vitamins A and D are commonly involves of milk fortification.

Since milk is an oil-in-water emulsion, the possibility exists to add vitamins in their oily form or use water dispersible forms of these. Ease of mixing has been identified as an advantage of using dry, water dispersible forms of the fortificant. However, the drawback of this was that vitamins were less stable in this form after addition to the milk as the protective coating dissolved leaving the vitamin susceptible to degradation (O'Brien and Robertson, 1993). Addition of oily vitamin preparations was recommended after dilution and pre-homogenization with a suitable quantity of milk. Addition of the vitamin mixture prior to homogenization of the bulk supply facilitates uniform mixing. Metered injections of the vitamin preparation upstream to the homogenizer have been the standard set up in continuous operation plants. As both of these vitamins are sensitive to oxidation, care must be taken to minimize aeration particularly during mixing stages.

Many iron compounds have been assessed in the fortification of pasteurized whole milk. At pasteurization temperatures below 79 °C off-flavours due to lipolytic rancidity developed

but these problems were greatly reduced by increasing the pasteurization temperature to 81 °C (Owen and MacIntire, 1975). De-aeration of the milk prior to the addition of iron compounds was also found to reduce flavour problems. The best fortification procedure was judged to be the addition of ferric ammonium citrate followed by pasteurization at 81 °C. In this way fortified milk containing 30 ppm iron was found to be acceptable after 7 days storage. Levels of vitamin E, vitamin A and carotene were not affected by the presence of iron. In the production of iron fortified evaporated milk, ferric orthophosphate was shown to be useful (Krutz, 1973). The uniform distribution of the iron compound was, however, known as a problem due to its low solubility.

Calcium fortification of milk and milk-based beverages has been carried out. Calcium fortificant preparations including stabilizers and emulsifiers have been used for this purpose to maintain calcium in suspension so as to improve mouth feel and appearance of products (Anon., 1986). In Germany a milk-based fruit drink has been marketed which is fortified with calcium, phosphorous as well as vitamins A, E, B and C.

3.7-Oil-

Fortification of oil with vitamin A in the form of retinylpalmitate has been attempted in Brazil (Nestel, 1993). Storage studies demonstrated that after 18 months of storage in dark sealed containers damages of more than half of the vitamin content were experienced. When storage was not carried out in the dark, most of the vitamin content was lost after 6 months. Packaging of the fortified oil in opaque containers was therefore demonstrated to be a critical consideration.

Vitamin A fortified oil indicated good vitamin retention after 5 months of storage in closed metal containers at high temperature and moisture.[xiii]

RESEARCH QUESTION-

What is conformity quality status of fortified wheat flour, oil and milk?

OBJECTIVES-

1. To know Aspects of Quality Assessment of Food Fortification Project.
2. To know Conformity status among fortified wheat flour, oil and milk.

METHODOLOGY-

- Type of study: Descriptive study.
- Method of data collection: secondary data
- Data analysis: Data analysis has done in MS Excel.

3-Results-

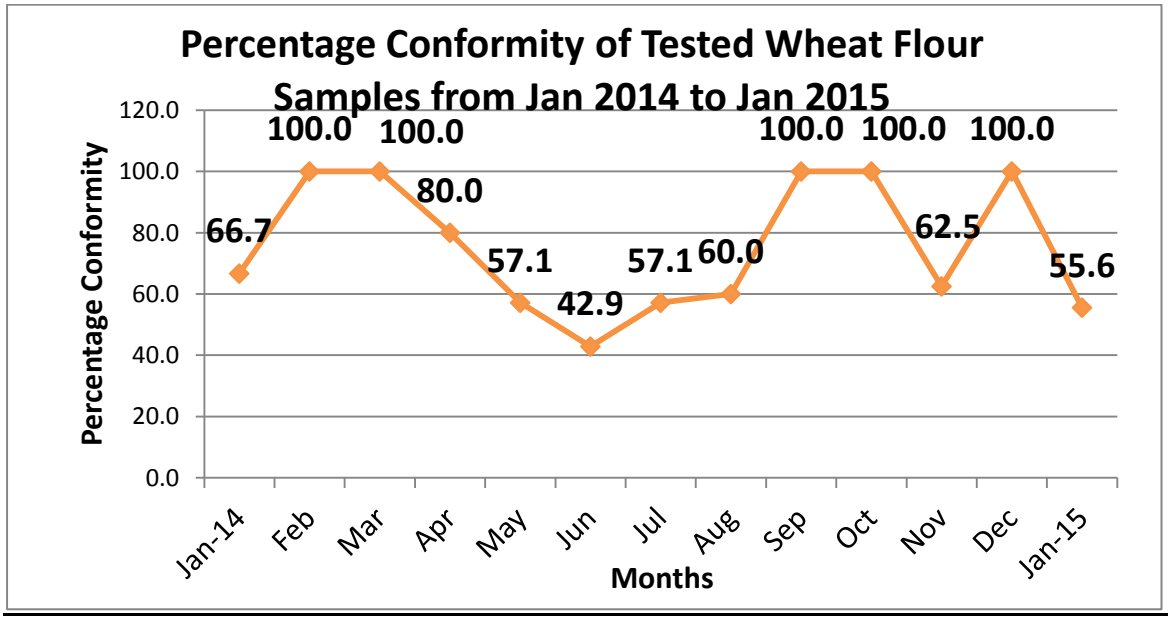
3.1-Roller Flour Mills -

Table-1. Samples and Conformity status of roller flour mills-

Month	No. of samples collected	No.of samples pass	% Conformity
Jan-14	3	2	66.7
Feb-14	2	2	100.0
Mar-14	2	2	100.0
Apr-14	5	4	80.0
May-14	7	4	57.1
Jun-14	7	3	42.9
Jul-14	7	4	57.1
Aug-14	5	3	60.0
Sep-14	7	7	100.0
Oct-14	12	12	100.0
Nov-14	16	10	62.5
Dec-14	12	12	100.0
Jan-15	9	5	55.6
TOTAL	94	70	74.5

(Data Source- IPS Project office)

Figure No. 1. Shows the percentage conformity of tested wheat flour samples of roller flour mills of Rajasthan from Jan 2014 to Jan. 2015



This graphs shows the 100 % conformity of tested wheat flour samples in Feb. 14 , March 14 ,Sep 14, Oct 14, and Dec. 14

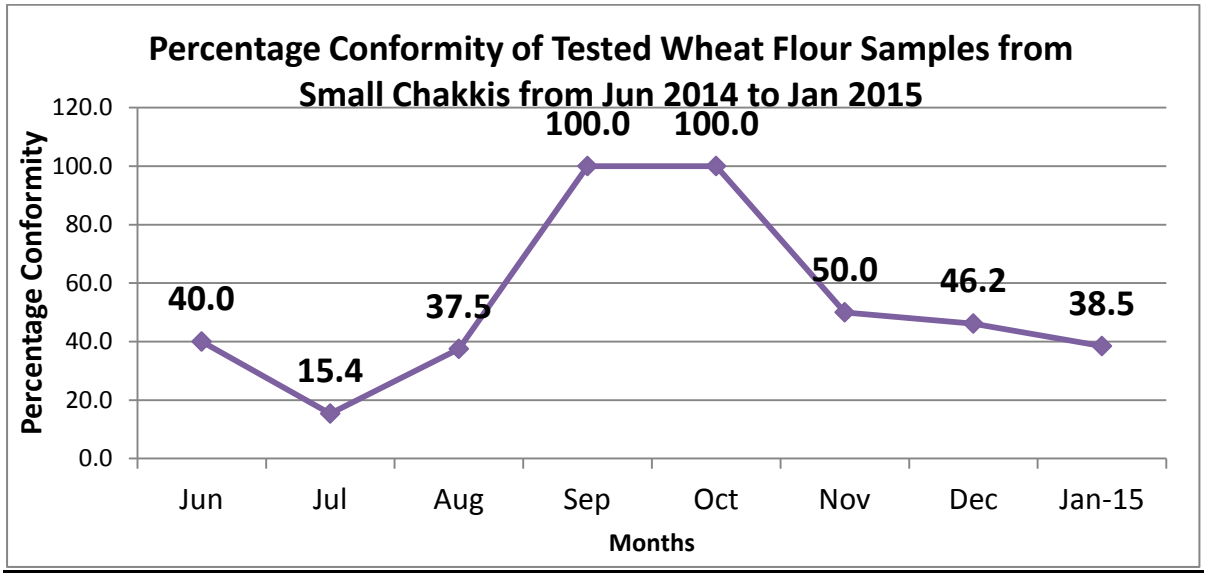
3.2-Small Chakki -

Table 2. Samples and Conformity status of small chakki-

Month	No. of samples collected	No.of samples pass	% Conformity
Jun-14	10	4	40.0
Jul-14	13	2	15.4
Aug-14	8	3	37.5
Sep-14	11	11	100.0
Oct-14	7	7	100.0
Nov-14	12	6	50.0
Dec-14	13	6	46.2
Jan-15	13	5	38.5
TOTAL	87	44	50.6

(Data Source- IPS Project office)

Figure No. 2 shows the percentage conformity of tested wheat flour samples of small chakkis of Rajasthan from Jan 2014 to Jan. 2015 .



This graphs shows the 100 % conformity of tested wheat flour samples in Sep. 14 and Oct .14.

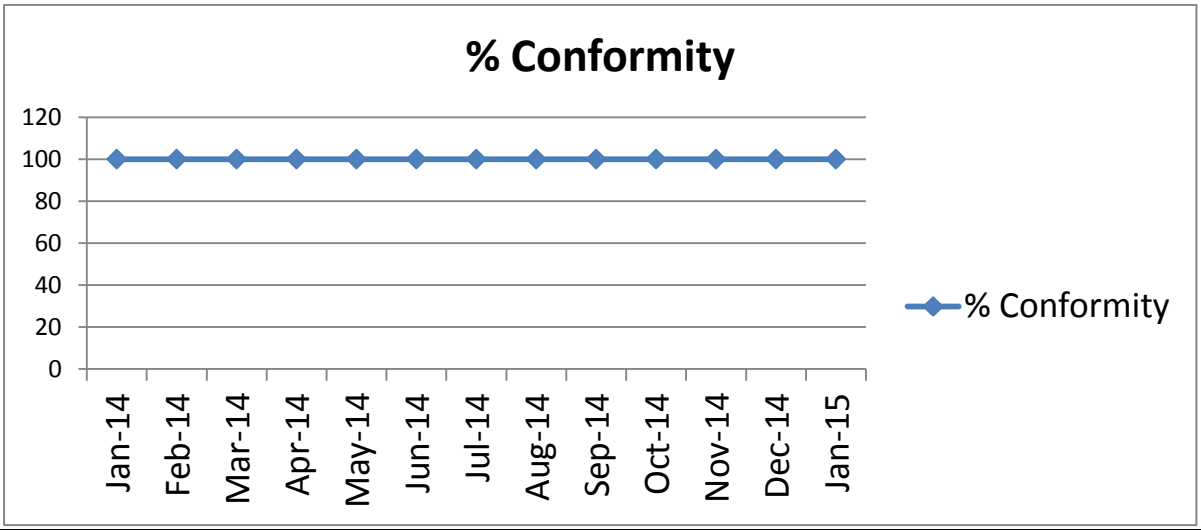
3.3-Oil Refineries-

Table 3. Samples and Conformity status of Oil Refineries -

Month	No. of samples collected	No. of samples pass	% Conformity
Jan-14	3	3	100
Feb-14	2	2	100
Mar-14	3	3	100
Apr-14	1	1	100
May14	2	2	100
Jun-14	3	3	100
Jul-14	1	1	100
Aug-14	3	3	100
Sep-14	2	2	100
Oct-14	4	4	100
Nov-14	2	2	100
Dec-14	4	4	100
Jan-15	2	2	100
	32	32	100

(Data Source- IPS Project office)

Figure No. 3 shows the percentage conformity of tested oil samples of Oil refineries of Rajasthan from Jan 2014 to Jan 2015.



This graphs shows the 100 % conformity of oil refineries all samples

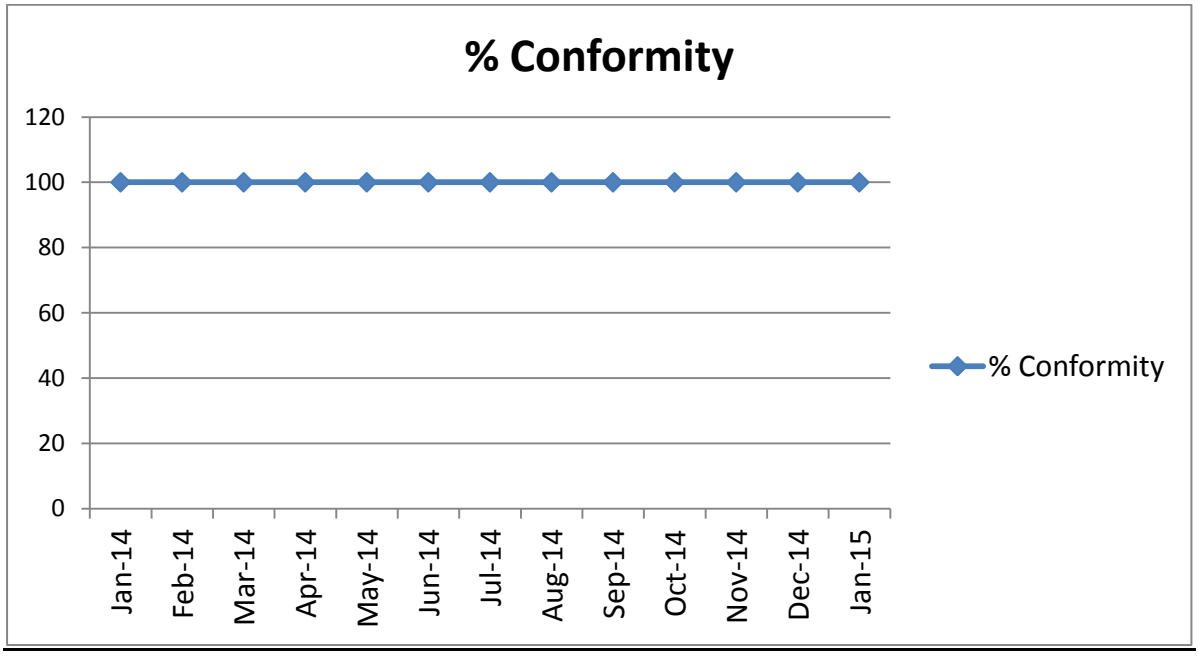
3.4-Milk –

Table 4. Conformity status of Milk Dairies-

Month	No. of samples collected	No. of samples pass	% Conformity
Jan-14	4	4	100
Feb-14	4	4	100
Mar-14	4	4	100
Apr-14	3	3	100
May-14	10	10	100
Jun-14	11	11	100
Jul-14	12	12	100
Aug-14	10	10	100
Sep-14	9	9	100
Oct-14	14	14	100
Nov-14	16	16	100
Dec-14	12	12	100
Jan-15	15	15	100
Total	124	124	100

(Data Source- IPS Project office)

Figure No. 4 shows the percentage conformity of tested Milk samples of Milk Dairies of Rajasthan from Jan 2014 to Jan. 2015.



This graphs shows the 100 % conformity of oil refineries all samples

Findings -

- Study shows that percentage of conformity wheat flour is less than oil and milk because it does not mix easily with fortification vehicle.
- Study shows that conformity oil and milk is 100 % because both are easily mixable with fortification vehicle.

Suggestions -

- Advise government leaders as they prepare national legislation and standards for flour fortification.
- Provide scientific guidance and support for research related to flour fortification.
- Some degree of regulatory monitoring is critical. Of the three main categories of regulatory monitoring – internal monitoring (conducted at factories and packers), external monitoring (conducted at factories and packers) and commercial monitoring (conducted at retail stores) – internal monitoring is a must. In settings where effective enforcement mechanisms exist, it is usually sufficient to confirm compliance with regulations in samples taken from retail stores (commercial monitoring). Elsewhere it is prudent to conduct external monitoring at both the factory level and at retail stores.

References-

[i]http://foodsystemsinnovation.org.au/resource/global-alliance-improved-nutrition access on dated 07/04/2015+
[ii]http://ffprajasthan.blogspot.in/p/about-project.html
[iii]http://ffprajasthan.blogspot.in/p/about-project.html
[iv]http://www.fao.org/docrep/w2840e/w2840e0b.htm
[v]http://www.fao.org/docrep/w2840e/w2840e0b.htm
[vi]http://www.fao.org/docrep/w2840e/w2840e0b.htm
[vii]http://www.ffinetwork.org/implement/premix.html
[viii]http://www.ffinetwork.org/implement/documents/Premix_Best_Practice270408.pdf
[ix](http://ffprajasthan.blogspot.in/)
[x]http://www.ffinetwork.org/monitor/index.html
[xi]http://www.ffinetwork.org/implement/index.html+
[xii]Annex 4 - micronutrient fortification of food: technology and quality control*
[xiii]Annex 4 - micronutrient fortification of food: technology and quality control*