



LANSA

Leveraging Agriculture for
Nutrition in South Asia

LANSA WORKING PAPER SERIES

Volume 2018 No 30

Supplementary Nutrition Programme under ICDS: Case Study of Telangana and Tamil Nadu

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July 2018

 **Funded by
UK Government**


MSSRF
Science for Sustainable Development

About this paper

This study is part of the research on post farmgate agri-food value chains under the research programme on Leveraging Agriculture for Nutrition in South Asia (LANSA) funded by UKaid from the Department for International Development, UK.

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Contents

Acronyms.....	4
Abstract.....	5
1 Introduction.....	5
2 Review of Literature.....	6
3 Methodology	7
4 The Programme and Findings.....	8
4.1 Operational structure.....	8
4.2 Telangana	9
4.2.1 Pregnant and lactating women.....	9
4.2.2 Children	10
4.2.3 Sourcing of food.....	12
4.2.4 Telangana Foods	12
4.3 Tamil Nadu.....	13
4.3.1 Women	14
4.3.2 Children	14
4.3.3 Sourcing of raw material.....	16
4.3.3.1 The women cooperatives.....	17
4.3.3.2 The private sector.....	17
5 Discussion	18
5.1 Agriculture linkage.....	18
5.2 Food fortification	19
5.3 Gender	19
5.4 Business perspective	19
5.5 Consumer perspective	20
5.6 Cost to the exchequer	21
5.7 Expenditure on SNP and prevalence of undernutrition	22
6 Conclusion.....	23
References.....	26

Acronyms

AWC	Anganwadi Centre
AWW	Anganwadi Worker
CFG	Christy Fried Grams
CDPO	Child Development Project Officer
DPO	District Programme Officers
ESMA	Essential Services Maintenance Act
FAO	Food and Agriculture Organization
GoI	Government of India
GSDP	Gross State Domestic Product
ICDS	Integrated Child Development Services
ISO	International Organization for Standardization
LPG	Liquid Petroleum Gas
NFHS	National Family Health Survey
NMP	Noon Meal Programme
PO	Programme Officers
RDI	Recommended Dietary Intake
RTE	Ready-To-Eat
SNP	Supplementary Nutrition Programme
SUW	Severely Underweight Children
THR	Take-Home Ration
TNCSC	Tamil Nadu Civil Supplies Corporation
UNICEF	United Nations Children's Fund
WDCW	Women Development and Child Welfare

Abstract

Government food distribution programmes have the potential to reduce malnutrition at scale. The Supplementary Nutrition Programme (SNP) under the Integrated Child Development Services (ICDS) in India presents a unique example of a state-led food distribution initiative to address malnutrition. Targeted at pregnant and lactating women, children (0-6 years) and adolescent girls, SNP uses an agri-food value chain-based approach to improve the nutrition status of these vulnerable groups. This paper examines the value chain of SNP under ICDS in operation in two states of India, Tamil Nadu and Telangana, with particular reference to reaching nutritious food to the vulnerable group of women and children. The salient features and the innovative aspects of the two value chains are highlighted and the effectiveness of delivery under each is examined.

I. Introduction

The South Asian region with 281 million undernourished people accounts for 27 per cent of the total global population of undernourished people.¹ Despite rapid economic growth, undernutrition rates in the region remain among the highest in the world. In India, the latest round of the National Family Health Survey (NFHS-4) reveals that while child stunting levels have come down, they continue to be relatively high at 40 per cent in many states (Gol 2017a).

The Supplementary Nutrition Programme (SNP), a component of the Integrated Child Development Services (ICDS) scheme of the Government of India, is an agri-food value chain-based public food distribution initiative to ensure that vulnerable groups get the required nutrition. ICDS is a mandated social protection measure targeting women and children launched by the Government of India in 1975. The objective of the programme is to provide essential services to ensure the health and nutrition outcomes of children 0-6 years of age, adolescent girls, pregnant women and lactating mothers.

Food distribution is a major component of ICDS, and SNP is the largest feeding programme focused on improving the nutritional status of children and women in India. As of September 2016, there were 1.35 million ICDS centres in the country, catering to an average of 75 beneficiaries per centre under SNP (Gol 2017b). Social protection programmes like SNP play a food safety-net role for the vulnerable groups. Engle et al. (2011) note that early childhood interventions are established pathways for reducing inequality in low- and middle-income countries. Targeted food distribution programmes have the potential for impact on nutrition outcomes (GloPan 2014).

This paper examines SNP through a value-chain lens and studies the system in operation in two states in south India, Telangana and Tamil Nadu. The level of undernutrition among children in both states is well below the national average as seen in **Table I**.

¹UN Sustainable Development Goals: <http://www.un.org/sustainabledevelopment/hunger/>

Table 1: Prevalence of child undernutrition in Telangana and Tamil Nadu

	Stunting (per cent)	Underweight (per cent)	IMR (per 1000)	U5MR (per 1000)
Telangana	28.1	28.5	28	32
Tamil Nadu	27.1	23.8	21	27
India	38.4	35.7	41	50

Source: NFHS-4 (GoI 2017a)

IMR: Infant Mortality Rate; U5MR: under-5 mortality rate

The paper is organised in six sections. Section 2 discusses the relevant literature in the area of agri-food value chains for nutrition and social provisioning of food; this is followed by the section on methodology of the study. The fourth section discusses aspects of SNP in Tamil Nadu and Telangana separately: detailing provision of food at the centres, sourcing of raw materials for both hot cooked meals and ready-to-eat supplements, and the role of the different actors along the value chain. Based on this understanding, the value chain of SNP in the two states is examined in the light of the conceptual framework of Henson and Humphrey (2015) and Maestre et al. (2017) in section five. The limitations and constraints are discussed; the concluding section attempts to bring together the key aspects of the study, examining the unique and innovative features in each value chain and their impact.

2. Review of Literature

A large section of the population in India, as well as in South Asia as a whole, is dependent on agriculture for its sustenance. Food intake is an important determinant of nutritional outcomes. A proportion of, or the entire, food consumption needs of both producer and non-producer households are however sourced from non-home production or through markets (Henson et al. 2013; Parasar and Bhavani 2016). Hence it is important to analyse the nutritional impact of agri-food value chains on consumers beyond the farmgate.

Globally, social protection is seen as a powerful medium in the post-2015 development agenda to address malnutrition and its root causes. Public expenditure in agriculture and the state's role are central to food safety nets (del Ninno and Mills 2015; FAO 2015a). The model can be through cash, voucher or direct food transfer, as also nutrition education, to bring about the desired change. Different examples of such initiatives are found across the globe (FAO 2015b). Studies in the last decade have examined effectiveness of agri-food value chains for nutritional gains (Allen and de Brauw 2017; Henson et al. 2013; Gelli et al. 2015; Hoddinott et al. 2015; Hawkes and Ruel 2011); however, focus on consumers has been missing (Hawkes 2009; Gelli et al. 2015).

Inflation and rise in food prices are a major factor in access to nutritious food from the market by poor households. A study on high food prices during the 2006-10 global financial crisis showed an adverse impact on access to nutritious food in developing countries. Even though a rise in prices could be a short-term feature, it may contribute to a longer-run impact on the prevalence of undernutrition, thereby highlighting the importance of food safety nets (Brinkman et al. 2009). An important source of nutritious food for the poor in developing countries is the public distribution of food through social protection measures like school meal programmes and those targeted at nutritionally-vulnerable population segments like pregnant women and young children in poor households. Literature suggests early childhood development initiatives directed towards children in

the poorest segment can have enormous returns on investment for economic growth in the long term (Lake 2011; Gowani et al. 2014). In this context, public investment on programmes like SNP has an essential role in supporting nutritional intake by vulnerable sections of the population. A study on ICDS in India confirms less prevalence of undernutrition in children in areas with significant coverage of ICDS centres (Saxena and Srivastava 2009).

3. Methodology

The conceptual framework by Henson and Humphrey (2015) and Maestre et al. (2017), on which this analysis is based, addresses the question: What public and private actions are needed to strengthen the impacts of agri-food value chains on nutrition? That is, promote ‘enhanced access to, and consumption of, nutrient-dense foods by vulnerable population groups’. Consumers at the end of the chain, ‘whose expenditure and demand preferences drive the chain, and whose nutritional interests are paramount’, are a vital part of the chain in making this assessment. Three key outcomes are listed as essential for sustained impact: i) food must be safe to eat on a sustained basis; ii) it must be nutrient-dense at the point of consumption; and iii) it must be consumed in adequate amounts on a sustained basis to bring about the desired nutritional outcomes. A set of ten requirements are also outlined for the success of market-based, nutrient-dense agri-food-based value chains: nutrition awareness, signalling, availability, affordability, acceptability, capturing value, incentives along the chain, coordination and governance, managing costs, risks and uncertainty, and an appropriate institutional environment.

SNP was shortlisted for case study as an example of a pro-nutrition value chain under the category of food distribution, from the 40 interventions examined in the India Country Review of agri-food value chain interventions aimed at enhancing consumption of nutritious food by the poor (Parasar and Bhavani 2016). Following a general description of SNP, the operational aspects of the programme in the states of Tamil Nadu and Telangana are studied in the light of the conceptual framework. The paper examines what the value chain of SNP in the two states has to offer in terms of effective delivery to poor households, especially for the women and children in these households.

The methodology followed comprised a review of literature, examination of secondary data, interviews with state government officials and a sample of actors at the lower end of the value chain, viz., the ICDS centre workers and consumers. The last was to enable a qualitative assessment of the operation of the programme on the ground. A desk review was undertaken to collect information about ICDS, SNP under it, and the value chain actors, from secondary sources of information — published reports, the Ministry website and related information on the internet. The government officials coordinating the programme at the state level in the two states were then contacted for getting a clear understanding of the value chain. Following this, with their permission, a survey was undertaken to make a qualitative assessment of the food distribution value chain under SNP in the two states. This entailed interviews with the actors in the value chain: the manufacturers of the components of the food distributed under SNP, the ICDS project officers, the anganwadi worker (AWW)² and helper-cum-cook at the ICDS or anganwadi centres (AWCs), as well as pregnant women and mothers of children coming to the AWCs.

²AWWs are women delivering services at ICDS/anganwadi centres

In Telangana, ICDS functionaries and women from three rural/suburban AWCs were interviewed; detailed discussion was also held with officials at Telangana Foods, a public sector enterprise manufacturing the weaning food for distribution under SNP. In Tamil Nadu, eight AWCs, two each in urban, rural, suburban and tribal settings, were covered and discussions held with ICDS project officers, centre functionaries and pregnant women and mothers of children. Discussions were also conducted with members of two women cooperative societies manufacturing weaning food and with a private sector player manufacturing the blend for weaning food. The information collected was analysed using the conceptual framework referred to at the beginning of this section.

4. The Programme and Findings

The ICDS programme is implemented by all the states of the country and the costs are shared equally by the state and central governments; some states supplement the provisions under the all-India scheme and allocate additional funds for the programme. SNP focuses on improving nutritional intake by providing 'spot feeding' and 'take-home rations' (THR) to the targeted beneficiaries, i.e., women and children.

The implementation of the programme, therefore, differs from state to state. **Table 2** summarises the nutrient delivery under SNP of ICDS and the budgetary allocation available for the same as per Government of India norms. The nutrient norm prescribed satisfies the minimum energy and protein requirement to be fulfilled under SNP for the different targeted groups.

Table 2: Cost and nutrient norms under SNP of ICDS

Target Group	Revised cost norms (₹) (per beneficiary per day)	Calories (kcal)	Protein (g)
(i) Children (6-72 months)	6.00	500	12-15
(ii) Severely underweight children (6-72 months)	9.00	800	20-25
(iii) Pregnant and lactating women	7.00	600	18-20

Note: ₹100 = ₹1.11 and 1 gram = 0.002 pounds

Source: Government of India, Ministry of Women and Child Development^{3,4}

4.1. Operational structure

The ICDS programme comes under the purview of the Ministry of Women and Child Development, Government of India. It is headed in each state by an official at the director level belonging to the Indian Administrative Service with a team under him/her. Every district has District Programme Officers and Programme Officers (DPOs/POs).

The programme operates through ICDS centres or AWCs at the village level in rural areas and municipality level in urban areas. The centres generally operate from rented premises and there is a provision under the programme for the rental amount payable. The norm is one centre for every population cluster of 500 to 1500 households and a mini-centre for a population cluster of 150 to 500 households. In tribal areas, this is 300-1500 and 150-300, respectively. The AWCs in a state are

³ Press Information Bureau, Ministry of Women and Child Development, Government of India

<http://pib.nic.in/newsite/PrintRelease.aspx?relid=104046>

⁴ The costs were revised in late 2017 to ₹8, 12 and 9.5, respectively, the study had been completed by then.

clustered together into 'ICDS projects', each headed by a Child Development Project Officer (CDPO). The CDPO has a group of supervisors under him/her. A supervisor is responsible for 20-25 AWCs. The AWW and helper-cum-cook are the key functionaries responsible for activities at each ICDS centre. The AWW is generally a woman who has been educated at least up to the secondary school level.

4.2. Telangana

Telangana is a new state formed in June 2014 through the bifurcation of Andhra Pradesh. The ICDS programme in the state comes under the purview of the Department of Women Development and Child Welfare (WDCW). There were 35,700 AWCs under 149 ICDS projects as of September 2017, reaching out to 2.8 million beneficiaries.⁵ SNP under ICDS targets pregnant women, lactating mothers, children aged 6 months to 3 years, and children between 3 to 6 years. The provisions for each of these categories under the programme are discussed below. Severely malnourished children are categorised separately for additional nutritional support.

4.2.1 Pregnant and lactating women

The government runs a 'One Full Meal' programme for pregnant and lactating women called *Arogya Lakshmi*, with the objective of reducing maternal and infant mortality. *Arogya* means healthy; *Lakshmi* is the goddess of fortune and prosperity and is a term used to refer to women. The programme had been launched in early 2013 by the undivided state of Andhra Pradesh under the name *Indiramma Amrutha Hastham*. It continues under the same name in Andhra and is called *Arogya Lakshmi* in Telangana state. The initiative ensures compliance with intake of required iron supplements by pregnant women and can be seen as addressing the needs of the mother and infant during the first 1000 days.

A woman is covered under the *Arogya Lakshmi* scheme once pregnancy is confirmed, and coverage continues after delivery till the infant completes 6 months. The prescribed meal meets 40-45 per cent of the daily calorie requirement for pregnant and lactating women. Freshly cooked food is served every day at lunch according to a pre-defined menu for the whole week. **Table 3** gives details of the weekly menu. Food is cooked by the anganwadi helper at the ICDS centre.

Table 3: Weekly menu under *Arogya Lakshmi* scheme

Day	Item 1	Item 2	Item 3	Item 4	Item 5
Day 1	Rice	Sambar with vegetables		Egg curry	Milk (200 ml)
Day 2	Rice	Dal	Green leafy vegetable curry	Egg	Milk (200 ml)
Day 3	Rice	Dal with leafy vegetables	Egg curry	Egg	Milk (200 ml)
Day 4	Rice	Sambar with vegetables	100 ml Curd	Egg curry	Milk (200 ml)
Day 5	Rice	Dal	Green leafy vegetable curry	Egg	Milk (200 ml)
Day 6	Rice	Dal with leafy vegetables	100 ml curd	Egg	Milk (200 ml)

Note: Sambhar is a preparation made using pulses and vegetables; dal is gravy made using pulses

Source: Department of Women and Child Welfare, Government of Telangana

The ICDS centres are closed on Sundays and to compensate for Sunday's provision of egg and milk,

⁵<http://wcdw.tg.nic.in/> and <http://nhts.telangana.gov.in/#/categoryreport>

women are given 100 ml of curd on two weekdays and egg curry on one of the week days. The preparation of egg, *sambar* and curry is different each day to avoid monotony.

Along with the 'one meal', women are periodically monitored for weight, and are given iron/folic acid (IFA) tablets; they are also provided counselling by the AWW. 'Spot feeding' is a unique characteristic of the *Arogya Lakshmi* programme and it ensures the food is consumed by the beneficiaries at the centre. Earlier, in the absence of this programme, take-home rations (THR) were provided to women; but this did not ensure consumption by them though it raised the availability of nutritious food within the household. Further, milk, a naturally nutrient-dense food often not affordable for women in economically-deprived families, is also provided under the programme.

Table 4 below summarises the cost and nutrient value of the food provided to the women under the scheme. The cost of the meal is ₹ 21/woman/day and it ensures 1192 kcal of energy and 37 gm of protein.

Table 4: Cost and nutrient value of food per woman provided under *Arogya Lakshmi* scheme

SI.No.	Item	Quantity per day	Tentative cost per day (₹)	Nutritive Value	
				Energy (kcal)	Protein (g)
1	Rice	150 g	0.6	517.56	10.2
2	Dal (red gram)	30 g	2.55	104.4	7.25
3	Oil	16 g	1.1	144	0
4	Vegetables (leafy vegetables, potato, onion, beans, etc.,)	50 g	1.5	52.5	1.8
5	Condiments		0.6	0	0
6	Milk (30 days) (@ ₹ 5.6 per day)	200 ml	9.85	273	10.03
7	Egg (30 eggs) (@ ₹ 3.5 per day)	1 No. (50 g)	4.2	100.92	7.76
8	Transport		0.1	0	0
9	Cooking		0.3	0	0
TOTAL			21*	1192.38	37.04

Note: *equivalent to ₹0.23 and 1 gram = 0.002 pounds

Source: Department of Women and Child Welfare, Government of Telangana

Provision of nutrient-dense foods at the AWCs also improves the administration of other health services for pregnant and lactating women. Pregnant women and lactating mothers at the three centres visited were appreciative of the hot meal they were provided. The AWWs also felt that the women found the *Arogya Lakshmi* scheme useful and came to the centre regularly for the noon meal. The kitchen was clean at each of the centres visited. Cooking was done on gas stoves. The helper – cum-cook keeps the place clean, fetches water and does the cooking; she is responsible for feeding the women and children.

4.2.2 Children

SNP targets reduction of undernutrition in children below 6 years of age through provision of therapeutic food and freshly-cooked meals. Children are segregated into two age categories — below 3 years and 3 to 6 years.

On the first day of every month, a 2½ kg packet of the therapeutic food called *Balamrutam* is given to the mothers of children aged below 3 years as take-home ration. *Balamrutam* is manufactured by Telangana Foods, a public sector enterprise; the mix is made from roasted wheat, chickpea, skimmed milk powder, sugar and oil.

Balamrutam is fortified with eight micronutrients— calcium, iron, vitamin A, vitamin B₁, vitamin B₂, vitamin C, folic acid and niacin. Intake of 100 g (0.22 lb) of the weaning food ensures 50 per cent of recommended dietary intake (RDI) required by a child per day. The food is calorie dense, provides protein, and its consumption is expected to reduce the prevalence of calorie/energy and micro-nutrient deficiency (hidden hunger) among children. Each child's nutritional status is monitored by measuring height and weight on the first day of every month. On the same day, mothers/guardians are given counselling according to the nutritional need of the child. In addition to *Balamrutam*, every month 16 eggs are given to mothers of children below 3 years as THR.

The programme provides additional nutritional intake for malnourished children. Children identified in these categories are fed with a spoonful of oil mixed with mini meals, 1 egg, 100 ml of milk and *Balamrutam laddu* (ball-shaped sweet) at the AWCs. This is provided in addition to the THR of *Balamrutam* and eggs. Children between 3 to 6 years of age come to the AWC for pre-school education and are fed the same meal that is given to pregnant and lactating women. **Table 5** summarises the cost and nutrient value of the food provided. Children are engaged with pre-school education activities at the AWC. Besides the noon meal, they are fed an extruded snack manufactured by Telangana Foods before they leave.

It was observed that the children were made to wash their hands before eating. The younger children were helped to eat by the AWW and helper. Mothers of children at the three centres visited said that they regularly sent their children to the centre.

Table 5: Cost and nutrient value of food spot fed to children aged 3-6 years

Sl. No	Item	Quantity per day	Rate per kg/lt (₹)	Cost per child per day (₹)	Energy (kcal)	Protein (g)
A. Main Meal						
1	Rice	75 g	4	0.3	258.78	5.1
2	Dal (red gram)	15 g	70	1.05	52.2	3.63
3	Vegetables	25 g	28	0.7	26.25	0.9
4	Condiments			0.25		
5	Egg (30 per month)	50 g	3.50/egg	3.5	86.5	6.65
6	Oil	5 g	59	0.33	45	0
7	Transport			0.1		
8	Fuel			0.2		
B. Snack Food						
9	Telangana Food: Nutri snacks (20gms) /chana dal (15 g)			0.83	80	2.4
TOTAL				7.26*	548.73	18.68

Note: * equivalent to ₹0.08 and 1 gram = 0.002 pounds

Source: Department of Women and Child Welfare, Government of Telangana

4.2.3 Sourcing of food

The major part of food, i.e., foodgrains and pulses for AWCs, are procured from the Department of Civil Supplies. Cooking oil is sourced from the AP Oil Federation and eggs are sourced through the National Egg Coordination Committee. Egg suppliers are identified by the project and the CDPO purchases the requirement for all the ICDS centres under a project. Milk is supplied by milk cooperatives in the state like Vijaya Dairy, or else sourced locally. The AWW is responsible for purchase of vegetables, condiments and cooking fuel. Children are also encouraged to bring vegetables from their homes under the *Akshaya Patram* scheme to encourage community contribution and engagement.

The AWWs are generally paid bi-monthly for the expenditure made, while expense for cooking fuel (LPG) is paid in ex-ante. In case of shortage of supply at a centre, the CDPO directs the food from neighbouring centres to meet the exigency.

4.2.4 Telangana Foods

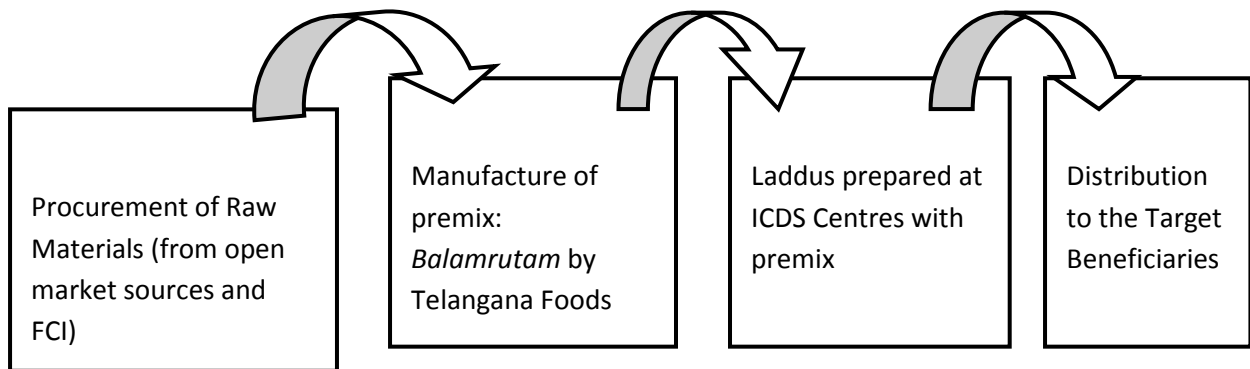
Telangana Foods (earlier known as AP Foods) is a state government enterprise established in 1976 for production of nutritious food for distribution to malnourished children and women under government food distribution programmes. The enterprise was set up with the help of CARE, UNICEF and the Government of India.

Currently Telangana Foods manufactures and supplies the therapeutic mix *Balamrutam* and extruded snacks to all the ICDS projects in Telangana. Earlier, other ready-to-cook premixes like *upma*, *halwa*, *khichri* mix and sweet porridge were also being produced. These mixes were given to children alternately to avoid monotony. All the premixes were fortified with additional nutritional content and they provided 50 per cent of the recommended dietary intake (RDI) to the children.

The production of ready-to-cook food started in 2005. Prior to that, ready-to-eat food was prepared and fed as porridge or *laddus* to children. The production of ready-to-cook food was stopped in mid-2013, following directives from the government that food locally sourced and cooked fresh should be provided at the centres. The directive, aimed at preventing entry of for-profit, premix manufacturers into the government-sponsored scheme, has however also affected the operations of the government enterprise, i.e. Telangana Foods.

Telangana Foods is an ISO-certified company following standard food technology practices; the costs are met by the Department of Women and Child Development. It has a Nutrition Council headed by the Chief Secretary to the Government of Telangana and includes a member from the National Institute for Nutrition to ensure proper oversight of the nutritional content in the products. This body meets once in six months and there is an executive committee that meets every quarter and oversees regular operations. The company has a separate quality assurance department that checks food quality at all levels of production, from procurement of raw material to the final product stage. There is a Quality Control check before every product is issued for processing and there is certification before the final product is cleared for distribution. Wheat is procured from the Food Corporation of India. The sourcing of other food materials is through tender process. **Figure 1** outlines the value chain for the preparation of premix by the company. The packaging is as recommended by the Indian Institute of Packaging; the institute suggests the parameters for labelling, packing material and other biological and chemical parameters. All residual waste is sold.

Figure 1: Premix Food Supply Chain in Telangana



Telangana Foods is currently catering only to Telangana state. As a result, there is less than 50 per cent utilisation of the production capacity of 300 t/day of the unit. The requirement for the fortified premix (*Balamrutam*) is 2500 t /month now and the quantity of extruded snack produced is 150 t /month. The enterprise also supplies to other departments and government programmes on demand; for instance, it was supplying food to AIDS patients under a joint initiative of the state government and the Clinton Foundation; it has supplied food to school children under the social and tribal welfare department; but these engagements have come to a halt after the state bifurcation.

The public enterprise model ensures some of the essential requirements for adequate nutritional intake, including intake of micronutrients and high energy food by children with due attention to quality food safety aspects; and is cost effective as pricing is done in consultation with the government departments and is as per the allocation available under the relevant programme. Although it was reported that the premixes were less palatable than freshly-cooked food on cooling, they were well accepted for consumption when served hot. The unit is governed by the Essential Services Maintenance Act (ESMA) and there is no labour union. With reduced production, the staff strength has been substantially reduced. The company has however made investments in expanding its production capacity with state-of-the-art technology, in anticipation of enhanced demand in future. This expansion exercise had commenced before state bifurcation. The developments in the interim left the company in a bit of a limbo. It is hoped that the company’s management will soon enter into agreements with other state governments, to supply their requirements and operate at full capacity.

4.3. Tamil Nadu

The ICDS programme in Tamil Nadu comes under the purview of the Department of Social Welfare and Nutritious Meal Programme. As of October 2016, there were 54,439 AWCs under 434 projects in the state, reaching out to 3.5 million beneficiaries.⁶ SNP under ICDS in the state has provisions catering to pregnant women, lactating mothers, adolescent girls, children aged 6 months to 1 year, children aged 1-2 years, children aged between 2-3 years and children between 3-6 years. Severely malnourished children are categorised separately for additional nutritional support.

⁶<http://icds.tn.nic.in/files/awcs.pdf> and http://icds.tn.nic.in/all_categories.html

4.3.1 Women

Adolescent girls and pregnant women are given a fortified premix in the form of THR as supplementary food. The AWC is provided with the required premix stock on a monthly basis. The premix is given to the women on a fixed day every week. Women in the ante-natal and post-natal stages are expected to consume 160 gm of premix per day. **Table 6** provides the details of quantity and cost of complementary food. Adolescent girls also receive the same premix for 130 gm of consumption per day. The composition of the fortified premix is given in **Table 7**.

Table 6: Per head cost and benefits of the complementary food

Category	Quantity of complementary food provided per day (gm)	Cost per beneficiary per day (₹)	Protein (min) (gm)	Energy (min) (kcal)
Children 6-36 months	130	6.5	11	455
Children 6-36 months (severely malnourished)	190	9.5	16	665
Pregnant women and nursing mothers	160	8	13.5	560

Note: ₹1 = 1 pence and 1 gram = 0.002 pounds

Source: Department of Social Welfare and Nutritious Meal Programme, Government of Tamil Nadu

Earlier, women had to consume the premix at the AWC itself, to ensure consumption by the intended beneficiary. But many women were unable to visit the centre everyday due to loss of wages if they took time off from work; so there was demand from women to be given stock of premix required for about a week. Given that women from the lowest economic classes are the main beneficiaries, these women tend to work until they reach the last trimester of pregnancy. Also, in rural areas the centres are not accessibly located as the population is usually scattered in comparison to urban areas.

Table 7: Composition of premix (in 100 kg)

Item No.	Particulars	Kilograms
1	Wheat/maize/bajra(kambu) flour	52
2	Malted finger millet flour	5
3	Chickpea dal flour	12
4	Powdered jaggery	30
5	Calcium Carbonate (700 g) Ferrous Sulphate (150 g) Vitamin premix (150 g)	1
	Total	100

Note: 1 kg = 2.21 pounds

Source: Department of Social Welfare and Nutritious Meal Programme, Government of Tamil Nadu

4.3.2 Children

The children coming to the AWC are categorised into 4 categories: 6 months to 1 year, 1-2 years, 2-3 years, and 3-6 years. **Table 8** below summarises the food provided for the different age groups.

Table 8: Provision of food to children of different age groups

Age groups	Food provided
6 months -1 year	130 gm/day of premix for normal children, 190 gm/day for severely underweight children (SUW)
1-2 years	130 gm/day of premix for normal children, 190 gm/day for SUW and one boiled egg every Wednesday
2-3 years	130 gm/day of premix for normal children, 190 gm/day for SUW and boiled egg thrice in a week and nutritious meals (Noon Meal Programme)
3-6 years	Nutritious hot cooked meal

Note: SUW-Severely Under Weight; Noonmeal programme

Source: Interview with ICDS officials

Usually children below the age of 2 years are not spot fed as the mothers do not prefer to leave them at the centre at this age. Even in the age group of 2-3 years, less number of children come to the centre; hence they only get the premix provided as THR to their mothers on a weekly basis.

Children who are severely underweight are given extra amount of premix (190 gm/day).

In urban settings, it was observed that the mother often sent her kids primarily for pre-school activities and not just for the healthy food. In all the centres visited, none of the children registered for anganwadi services were found to be underweight. While interviewing an AWW at a centre in Chennai, it was observed that children not enrolling at the AWCs were found to be underweight. No strong conclusion in the association of visiting the anganwadi and nutritional status can be drawn (given the size of sample), but it may be said that the feeding programme is fulfilling the gap between recommended and actual intake by children.

About 45 days' stock of all grains are provided to the AWC; like in Telangana, the AWW has to buy the vegetables and condiments for cooking. The allocation for condiments, spices and vegetables are fixed. The quantity of vegetable in the food, therefore, varies according to the prevailing market prices. The expenditure towards purchase of vegetables, condiments, spices and LPG for cooking is reimbursed once in two/three months. The menu for the noon meal is pre-decided as was found in Telangana and is detailed in **Table 9**.

Table 9: Menu for hot meal served at AWCs in Tamil Nadu

Days	Menu
Monday	Tomato rice and boiled egg
Tuesday	Mixed rice with boiled black chickpea/green gram
Wednesday	Vegetable rice and boiled egg
Thursday	Lemon rice and boiled egg
Friday	Dal rice with boiled potato
Saturday	Mixed rice

Source: Personal Interviews

Most of the AWCs have LPG connections while a few still continue to cook with firewood and are in the process of receiving the LPG connection.

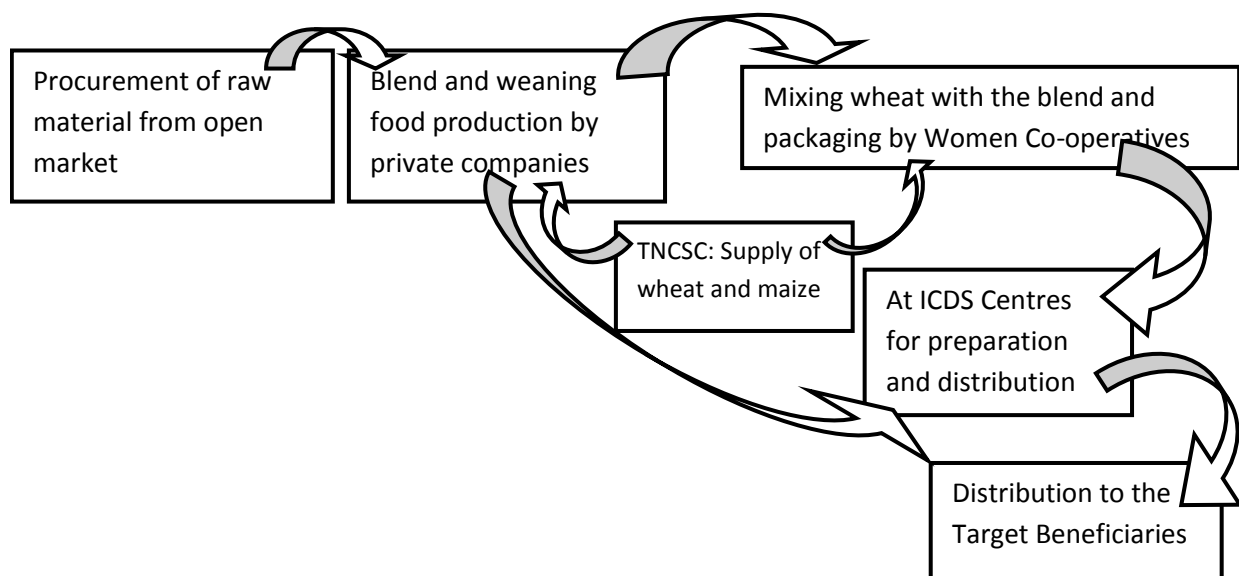
4.3.3 Sourcing of raw material

The Co-operation, Food and Consumer Protection Department of the state government is responsible for the supply of the major items — rice, pulses and cooking oil — to the AWCs through the Tamil Nadu Civil Supplies Corporation (TNCSC). The estimated requirement for a centre is calculated by the AWW and the information is collated at the ICDS director’s office, which then coordinates with the TNCSC for the supplies.

Vegetables are bought locally from the market. At times, vegetables are also sourced from wholesale markets in the vicinity. The *Akshaya Patram* scheme that encourages children to bring vegetables to the AWC is in vogue here also. But in most of the AWCs the scheme is not in practice, as the households feel that the AWW (or the government) is responsible for the provision of vegetables.

The fortified premix is made from a blend of jaggery, chickpea, malted finger millet and micronutrient fortificant mixed with wheat/maize flour in the ratio of 48:52. Wheat is procured from the TNCSC; other raw materials are purchased from the open market. There are two variants of the public-private partnership (PPP) model for production of the premix in the state: one is the production by a partnership of women cooperatives and a private sector manufacturer and the other by the private sector manufacturer as the sole operator. In the first model, the private enterprise manufactures the blend and the women cooperatives are responsible for production of the premix along with the blend, as well as packaging and transportation of the final product; in the latter, the entire production, packaging and delivery is the private player’s responsibility. About 75 per cent of the total premix requirements are sourced under the private enterprise - women’s cooperative value chain. **Figure 2** gives a diagrammatic representation of the two models.

Figure 2: Premix Food Supply Chain in Tamil Nadu



4.3.3.1 The women cooperatives

The women cooperatives were initiated by the state government around the year 1988 to empower women socially and economically; the cooperatives are engaged in different enterprise activities, preparing the supplementary nutrition component under ICDS is one of them. The members of the cooperative generally belong to families below-the-poverty line, Scheduled Caste community, widows and destitute women.

Interaction with the members revealed that the women were able to earn a steady income and provide for the upbringing of their children. In early days of the cooperatives, the production capacity was limited, as sourcing of the raw materials in the huge quantity required was not always possible due to capital constraints and the limited scale of operation. Processes like milling of flour were outsourced. These bottlenecks affected their revenue. The members are paid wages on the basis of quantity produced, and as the volume was limited, the wages were also low. Moreover, at times there were problems with product quality leading to product rejection and no payment. This was addressed innovatively by the state government about a decade ago by bringing in a private player to manufacture the fortified blend that goes into the premix. There are 25 women cooperatives in the state engaged in the manufacture of weaning food and they supply to the AWCs across 25 districts and in some cases in other neighbouring districts too.

The blend is manufactured and supplied to the women cooperatives by the private enterprise. The cooperatives source wheat from the Department of Food and Civil Supplies; the wheat grain is milled into flour by them, mixed with the blend in the required ratio and packed and supplied to AWCs. With this arrangement, the cooperatives have been able to increase their production capacity, overcome the risk of procuring raw materials from the open market and tackle problems of volume. Quality standards have also improved as the private enterprise is able to invest more and have better economies of scale. Currently, the cooperative members get ₹ 2.4 per kg of premix produced, and on an average a member is able to earn around ₹ 17000 or £189 per month.

4.3.3.2 The private sector

The blend manufacturers are selected by the Government of Tamil Nadu through a competitive bidding process; currently, there are two private sector players: Rasi Foods and Christy Fried Grams (CFG). Both the players have been part of the SNP value chain in Tamil Nadu for the last 10 years. Wheat is supplied to them by the Department of Food and Civil Supplies; their dedicated market teams source the other raw materials from across the country based on considerations of quality and price. For e.g., finger millet is procured from Karnataka and maize is at times procured from as far as the state of Bihar in east India. So the scale of operation has given the scope to scout for best quality and competitive prices for the bulk of the purchases.

Rasi Foods manufactures and directly supplies the weaning food (the final product: blend with wheat/maize flour) to centres in 10 districts, and CFG directly supplies the weaning food to 4 districts and the blend to all the 25 women cooperatives for manufacture of the premix. CFG has a production capacity of 1000 mt/month and produces around 550 mt of the blend every month. In addition, the company undertakes production of a popular commercial extruded snack (around 700 mt/month) and also produces its own brand of geriatric food (250 mt/month) for the elderly. CFG has its own accredited laboratories for microbial and chemical testing of the products. The quality checks are done at different levels of production, right from the procurement of the raw materials.

The production process is largely mechanised from cleaning, de-stoning, husking, and roasting of all the foodgrains to packaging of the blend and the weaning food. The blend produced contains germinated finger millet that leads to amylase activity in the food leading to better absorption in the body.

Every month the required quantity of weaning food is indented by the ICDS director's office to the two private enterprises and to the cooperatives. The anticipated quantities of raw material are procured with a buffer stock of at least 45 days. The final product is given to the AWCs within a fixed time period of about 20-25 days in a month. The cost of transportation of the weaning food to the AWCs is borne by the cooperatives and the private companies.

The induction of a private sector partner has led to higher scale of production; the quality standards of the final product have improved; and the wages of the members of the women cooperatives has increased, contributing to their sustainability. Earlier the mix was only provided to undernourished children whereas now it is provided to all children. Moreover in the districts where the cooperatives do not operate, the private players supply the weaning food directly to the ICDS centres.

5. Discussion

SNP under ICDS is a major social protection measure that reaffirms the states' commitment to improving the nutritional outcome of children and their mothers. As in social protection measures through food transfer or distribution, it entails an agri-food value chain and the involvement of multiple actors. As a food-transfer scheme entailing hot cooked meals and fortified mixes, SNP addresses many issues that arise with regard to consumer choice. For e.g., the irregular consumption due to the 'Food Stamps' policy in USA was associated with rising obesity rates (Dinour et al. 2007). The hot cooked meal is an important and non-substitutable part of the programme. Efficiency of value chains for raw foods that go into this meal is essential. The fortified premix is the other vital component and there are two different models in operation in the two states.

Though led by the state, there is scope for active engagement of the business and private sectors and civil society for effective delivery under these initiatives. Different models on these lines are found to be in operation in different states, two of which have been studied here.

This section attempts to highlight some key aspects of the agri-food value chain under SNP in the two states discussed in the previous section.

5.1. Agriculture linkage

The staple grains for use under SNP are provided by the government. The procurement of major foodgrains by the state at a pre-announced minimum support price reduces risk of market failure for farmers and hence incentivises them to produce essential foodgrains, thereby ensuring their availability. This mechanism ensures one of the requirements, i.e., 'managing risk and uncertainty' (Henson and Humphrey 2015; Maestre et al. 2017) for a part of the agri-food value chain. The limited scale of farmers' production inhibits any direct linkages with the buyers (private players, women cooperatives and Telangana Foods); the role of the state is important here.

In the case of vegetables that have to be procured from the market, however, with volatility in prices, the serving amount varies. This relates to an important requirement from the consumers' perspective, viz., 'availability' of nutrient-dense food (Henson and Humphrey 2015; Maestre et al. 2017). Vegetable markets in India are not always efficient (Gandhi and Namboodiri 2002); so sourcing vegetables from these markets with a fixed budget allocation could be a challenge. It is reported that an initiative in Bangladesh has linked with mothers' groups for supply of hot cooked meals to schoolchildren based on locally-grown produce.⁷ Linking local vegetable growers with the AWCs is one of the potential spaces to improve availability of vegetables.

5.2. Food fortification

Studies have shown that developing countries have low dietary quality with dominance of starch and carbohydrate in the diets (Ruel 2002). This makes SNP an important vehicle for increasing consumption of micronutrients by women and children in poor households. While vegetables are an important source of micronutrients, use of fortified cooking oil with micronutrients like vitamin A can also address hidden hunger caused by micronutrient deficiency. Fortification in general poses public health challenges because of potential over-consumption of added micronutrients (Crane et al. 1995). SNP provides a better vehicle for fortification as, unlike commercial value chains, quantity of consumption by the beneficiaries is not unobserved.

5.3. Gender

SNP targets women for improving their nutritional status and that of future generations. So gender is a key focus in the value chain. The value chain also provides employment opportunities to women as AWWs and helpers. The AWW can be perceived as an agent of change as she has direct contact with the women in the community and she is a part of the same community.

However, the AWWs are also under tremendous pressure as they are the most important point of contact for many other programmes. Hence, the role of 'change agent' might be undermined in this setup. Perhaps it is important to educate and sensitise the AWWs about their importance and to promote them as respected anganwadi 'teachers' rather than 'workers'.

In Tamil Nadu, the women's cooperative is a major actor in the value chain, giving an opportunity to women from economically-deprived households to have sustainable livelihoods.

5.4. Business perspective

Both the states have distinct production systems for manufacture of the complementary food, presenting models of public-private-cooperative partnership in one and a public sector enterprise in another. While Telangana Foods has seen a continual enhancement in its capacity, Tamil Nadu has improved its production capabilities with innovations in the value chain.

Tamil Nadu initially sourced the premix from a private enterprise in Mysore; later it was manufactured on a weekly basis at the AWCs. Then in 1988, when the state was encouraging development of cooperatives across sectors, the initiative was leveraged for manufacture of premixes by women cooperatives in each district. As discussed in section 4, the state subsequently introduced private players in the value chain about a decade ago to enhance production and maintain

⁷<https://www.gainhealth.org/knowledge-centre/project/community-led-integrated-school-nutrition-program/>

quality standards. This has also enabled creation of greater value to the women cooperatives as the income of the members is linked with quantity of production. The private sector players, besides partnering in the SNP supply chain, operate in the commercial market space as well and are free to diversify their production base. The large-scale production of the food blend ensures value creation for the private players, even though there is a component of uncertainty because of fluctuation in market prices of foods like finger millet, pulses and jaggery. Assurance of demand for the blend by cooperatives and manufacture of premix by AWCs ensure that both the private sector player and the cooperatives avoid the risk of overproduction/excess supply.

The cooperatives are based at district level and this ensures good coordination, reducing logistic difficulties in reaching the centres. Moreover, the structure also helps the district level officers establish coordination between the private player, cooperatives and the production requirements of the department.

Hence, it is found that the public-private-cooperative sector partnership in the value chain has brought production efficiencies and more value creation for individuals. The enhanced value creation and reduced uncertainty with regard to other aspects are of importance, especially to the women cooperatives whose members come from deprived socio-economic backgrounds.

In the case of Telangana Foods, however, the current scenario of underutilised capacity following state bifurcation has resulted in reduction in labour involved in the production of the premix. Given that is a public sector enterprise established with the support of the central government, measures have to be taken for the company to cater to the requirements of more states to ensure sustainability.

5.5. Consumer perspective

The consumers' perspective of the value chain has been analysed using the framework by Henson and Humphrey (2015) and Maestre et al. (2017). . Along with provisioning of food, the programme has special focus on increasing **nutrition awareness** among the beneficiaries. In both the states, consumers were aware about the importance of hot cooked meals and fortified food provided by the centre. Consumers perceived the food to be nutritious as it is distributed by the government to address undernutrition. The response of a pregnant woman when asked about the taste of the premix shows the **credibility** of food as perceived by a consumer:

"..I like the taste. Even if I dislike it, I would consume it... it is good for my health" Pregnant woman in the final trimester at an AWC in Chennai, Tamil Nadu

The labelling of the premix with nutritional information reinforces the credibility of the fortification; however, in Tamil Nadu the premix is distributed in loose packets to the beneficiaries, though only the bulk packets supplied to the AWCs has the necessary labelling.

The hot cooked meals are well accepted by the community as highlighted in sections 4.2 and 4.3; the premix is readily used by beneficiaries with warm water or milk. Food at the centres is available throughout the year as the buffer stocks and other necessary logistic support mechanisms are well managed by the concerned government department. However, price fluctuations have implications for availability of foodstuffs like vegetables that have to be procured from the market on a regular

basis. Government initiatives like *Akshaya Patram* encourage households to donate vegetables to the centres but they have not worked. When asked about the initiative, an AWW responded:

“...people asked, why should we donate when government is providing allocation for it (buying vegetables).” An anganwadi worker in Vasnapatti, Tamil Nadu

The distance to the centres poses an important trade-off for policy makers between spot feeding and THR for beneficiaries. Pregnant women in the last trimester might find it difficult to reach the centre for food, especially in rural settings where centres may be far because of lower population density. Further, women in lower economic sections are often occupied with paid work; travelling the required distance for a meal would affect the time spent on work and hence their income.

On the other hand, consumption of THR is unobserved and there are chances of its being shared with other family members. Provision of nutritious food like the hot cooked meal in Telangana may however reduce the trade-off for women in travelling the distance for availing it.

5.6. Cost to the exchequer

Both Tamil Nadu and Telangana are investing higher amounts in the programme than prescribed by the Government of India. By way of examining the cost to the exchequer towards the state’s role in this food distribution initiative, the annual cost of providing a hot cooked meal under *Arogya Lakshmi* to pregnant and lactating women covered under ICDS in Telangana was worked out. **Table 10** gives the annual cost to the state for making this provision; calculated on the basis of coverage and per head cost, it is seen that it costs just 0.1 per cent of the Gross State Domestic Product (GSDP). Using the same per head cost of providing a hot cooked meal to pregnant and lactating women, the cost of providing it in Tamil Nadu was worked out, as an example to further highlight the annual cost to the exchequer. Again, taking the number of women as reported by coverage under the scheme, the cost worked out to just 0.06 per cent of the GSDP.

Table 10: An estimate of cost to exchequer for providing hot cooked meal to women under ICDS

State	No. Of women	Cost per day per head in ₹	Estimated total annual expenditure (in ₹ million)	GSDP current prices 2013-14 (₹ in million)	Percentage of GSDP
Telangana	5,18,215	21	3,458.8	5,831,172.5	0.059
Tamil Nadu	649,249	21	4,226.6	12,126,679.9	0.035

Sources No. of women covered by the SNP under the ICDS scheme: <http://wdcw.tg.nic.in/index.html#>; http://icds.tn.nic.in/all_categories.html;

Reported per head/day cost: http://wdcw.tg.nic.in/Arogya_Lakshmi.html;

Nominal GSDP: NITI Aayog State Statistics: <http://niti.gov.in/state-statistics>.

This cost does not include other than provision of food for the target section. This analysis was undertaken only to show an approximate estimate of costs for any other state in India to roll out a similar programme for women. Tamil Nadu currently has a direct cash transfer scheme for pregnant women.

Similar analysis can be done for other categories (i.e., children) where the number of beneficiaries is higher but per head cost is lower than for women.

5.7. Expenditure on SNP and prevalence of undernutrition

Having established the relatively low burden on the government exchequer, it was examined if the additional amount spent has any association with prevalence of undernutrition in children, using state level data for nutrition outcome indicators. This is presented in **Table II**.

Table II: OLS regression to see the association of prevalent undernutrition with per beneficiary expenditure on SNP at state level

Prevalence of Stunting	Coef.	P>t	
<i>Per Capita expenditure on SNP FY13 (in Rs)</i>	-0.0048	0.006	R-squared = 0.104
<i>Constant</i>	41.36	0	Number of states = 27
Prevalence of underweight	Coef.	P>t	
<i>Per capita expenditure on SNP FY13 (in Rs)</i>	-0.0045	0.008	R-squared = 0.114
<i>Constant</i>	32.35	0	Number of states = 27
Prevalence of stunting	Coef.	P>t	
<i>Per capita expenditure on SNP FY13 (in Rs)</i>	-0.0036	0.023	
<i>Percentage of children fully immunised</i>	-0.248	0.088	R-squared = 0.275
<i>Constant</i>	56.06	0	Number of states = 27
Prevalence of Underweight	Coef.	P>t	
<i>Per capita expenditure on SNP FY13 (in Rs)</i>	-0.004	0.03	
<i>Percentage of children fully immunised</i>	-0.177	0.156	R-squared = 0.2042
<i>Constant</i>	42.8	0	Number of states = 27

Note: Per Capita expenditure on SNP FY13= (Number of beneficiaries as on December 2013)/Total Expenditure on SNP FY2012-13⁸

It can be seen from **Table II** that there is a significant negative association of per capita expenditure on SNP with prevalence of undernutrition. This implies that if a state spends an additional rupee on beneficiaries of SNP than other states, that state has significantly less proportion of undernourished children. Apart from SNP, being covered by the AWCs influences the rate of vaccination as the AWW closely follows the health condition of pregnant women. To further understand the impact of money spent on food through the AWC, rate of vaccination was controlled in the last two regressions. Even then it is found that the per capita expenditure on SNP is significantly associated with prevalence of undernutrition.

From **Tables 10** and **11**, it can be stated that at the existing level of expenditure on SNP, there is scope for further capitalising on the system to improve the nutritional status of children, especially in states with high prevalence of undernutrition. Studies have shown lesser prevalence of undernutrition among children registered with ICDS centres and in areas with significant coverage of the centres (Kapil and Pradhan 1999; Saxena and Srivastava 2009).

Both Telangana and Tamil Nadu are spending more from their own funds over and above the central government allocation under the programme, highlighting their commitment to address the problem of undernutrition among vulnerable sections of the population in their states. **Table 2** summarises the spending norm set by the Government of India, to be shared equally by the central and state

⁸Data Source: Annex-I and Annex-II: LOK SABHA ANNEXURED UNSTARRED QUESTION NO. 1327 DATED 18.07.2014 http://164.100.47.132/annexture_new/lsg16/2/au1327.html; Rapid Survey on Children 2013-14 is used for estimation of prevalence of undernutrition and immunisation

governments. Telangana spends ₹ 21/woman under the *Arogya Lakshmi* scheme, i.e., ₹17.5 extra from the state budget. In Tamil Nadu, 2-3 year old children are also provided hot cooked meals in addition to the 3-6 year old children as per the norm set by the Government of India (GoI). The per head cost for complementary food for 6 months to 3 year old children in Tamil Nadu is higher at ₹6.5 compared to the ₹6 GoI norm. In Telangana, the expenditure on children 3-6 years old at ₹7.3 is again higher than the GoI norm of ₹6 per child. Tamil Nadu, it may also be noted, has a superior track record in delivery under food and nutrition policies (Cavatorta et al. 2015). This is reflected in the comparative lower rate of stunted children in Tamil Nadu, shown in **Table I**.

6. Conclusion

SNP being a targeted value chain backed by the state has potential for impact on nutritional outcomes at scale. The scope for public-private partnerships and a role for private business engagement in improving nutrition outcomes are dimensions that provide for innovation.

The two models of state enterprise-linked food-distribution value chain and private-cooperative sector partnership in the value chain suggest innovative pathways for consideration: the state-private-cooperative sector partnership model in Tamil Nadu and a state enterprise dedicated to manufacturing pro-nutrition agri-foods to address undernutrition through government food distribution programmes in Telangana (See **Box I**). Each has lessons to offer for other states to emulate and adopt for delivery under the nationally-mandated food distribution programme.

Telangana Foods has production capacity that can be drawn on to service the requirements of similar programmes in other states. A company setup exclusively to cater to the requirements of the government food distribution programmes is a unique model that reinforces the state's capacity and willingness to promote and sustain the value chain targeting women and children from economically poor households. Unfortunately, the company's production is not being utilised fully following bifurcation of Andhra Pradesh into Telangana and Andhra, with the company catering only to the requirements of Telangana at present. It is hoped that the capacity available will be harnessed for the purpose the enterprise exists and the company will soon operate to its full potential.

Examining against the conceptual framework in Henson and Humphrey (2015) and Maestre et al. (2017), it can be said that the programme in operation in both Tamil Nadu and Telangana is equipped to deliver the three outcomes of i) sustained and safe ii) nutrient-dense and iii) adequate food to women and children from poor households. The potential for improvement under the first two factors does, however, exist.

The food safety issue of the premix is dealt with well till it reaches the women (mother of child, pregnant and lactating women). But the adequacy of consumption is uncertain if unobserved. In Tamil Nadu, the women are not provided with sealed packets, and hygiene and food safety could be an issue though the existing infrastructure was found to be well maintained.

Box I Value chains for nutritious premix under SNP

Provision of supplementary nutritious premix at the AWC exists in many states including Tamil Nadu and Telangana. However, the value chain for distribution differs in the two states considered, though the intended delivery is the same i.e., provision of nutrient-rich, energy-dense food to targeted demographic groups.

Tamil Nadu has a value chain comprising private firms and women cooperatives for production and distribution of the premix while in Telangana, the production and distribution is done by a state-owned enterprise.

The key features of each are discussed below: government at national and regional levels.

- 1. Reach:** The women cooperatives are spread across Tamil Nadu and production of SNP premix is decentralised; Telangana Foods is a centralised production system with distribution through the ICDS department.
- 2. Risk for public investment:** Public food distribution requires huge production capacities. In a dynamic and uncertain policy environment, a public enterprise risks a large amount of public investment. In Telangana, there is a situation of underutilised capacity after the Supreme Court ruling against distribution of ready-to-eat (RTE) food in AWCs. Moreover, after the state's bifurcation (erstwhile Andhra Pradesh into Telangana and Andhra), Telangana Foods is operating below its full capacity.
- 3. State's level of economic development:** A state with lower economic prosperity or with high policy uncertainty may find it difficult to have huge private investment for a public food distribution initiative. Moreover, less developed economies will also find it difficult to avoid a monopoly situation because of the limited number of private players. Hence, the state-owned enterprise plays an important role in developing the production capacity.
- 4. Cooperatives and social welfare:** The women cooperatives, besides being players in the food distribution chain, also support the economic upliftment of their members. It is an appreciable fact that Tamil Nadu selects socially- and economically-deprived women for cooperative membership. The women involved were found to be content with their work and earnings. The initiative generates greater social welfare through the premix value chain.
- 5. Importance of mixed value chain:** Tamil Nadu initially had only the women cooperatives and no private players. The inclusion of private business has made the value chain more efficient and has also helped women cooperatives get increased earnings. The lesson is, a state can have cooperatives but the limited economies of scale can limit the productivity and earnings for the producer; necessary innovation in this regard is essential.

The state-led SNP under ICDS is a food distribution agri-food value chain that has an important role in supporting access to nutrient-dense food by women and children from low income groups. The economies of scale bring efficiency in value chains and this in turn makes the chain sustainable for the actors. The benefits of extra investment by the state in alleviating undernutrition are also visible as shown in **section 4**.

This paper examined the value chain in process in two states. Other models are also found to be in operation. For instance, in Odisha too, children from 3-6 years are fed hot cooked meals at the ICDS centres and fortified premix provided to children below 3 years as also to pregnant and lactating women (NITI Aayog 2015). The premix in Odisha was earlier being centrally manufactured, but since 2011 it is being manufactured by women's self-help groups and federations. This kind of production system, however, raises concerns over quality standards of the premix. In Gujarat, therapeutic food called *Bal Bhog* manufactured by private enterprises for children below 3 years is distributed through ICDS centres as part of SNP. The manufacturer is selected by a process of e-tender.

The point to note is that there can be different kinds of production systems and states can keep evolving the process of production, based on the policy focus. All these systems have both relative advantages and limitations. States choose between the different models, given their capabilities and willingness; the two different models examined in this study can help in designing a better production and delivery system for other states in India and may offer insights for other countries in the region as well.

Looking at experiences globally, one finds public expenditure in agriculture and government roles as being central to food safety nets in a comparative evaluation of four countries — Bangladesh, Ethiopia, India and Zambia (del Ninno et al. 2007). The food provided under SNP at the ICDS centres has a variety of ingredients, including millets, pulses and vegetables. The Supplementary Nutrition Programme can be seen as the link for translation of agricultural productivity into favourable nutritional outcomes. As the programme is dependent on effectively sourcing agricultural produce, the policies underlying SNP have implications for farmers and the agriculture sector. Further, decentralised procurement of locally-available nutritious crops (besides rice and wheat) by the states may provide an incentive for higher production by reducing the market risk for the producers.

From the agriculture perspective, it is important to note that a large part of cultivable land in India is under rain-fed/dryland agriculture; these areas have traditionally produced millets, also referred to as orphan crops. Millets are naturally nutrient-dense and climate-resilient crops suited for dryland farming regions. The National Food Security Act 2013, India, provides for procurement of millets by state governments. Linking millet-producing farmers with SNP through decentralised procurement both for weaning food and use in the hot cooked meals as well as using the capacities of companies like Telangana Foods and the private sector enterprises in Tamil Nadu for post-harvest processing can promote large-scale consumption of millets. This has potential to trigger a pro-nutrition agri-food value chain beyond the farmgate with required incentives for post-harvest processing; at the same time, this would also ensure assured price for the farmers. Additional provision of millets under hot cooked meals of SNP has the potential of these positive spill-over effects for their cultivation, consumption and commerce.

Overall, SNP under ICDS is unique in using a life-cycle approach to reach some of the most vulnerable groups, viz., children, adolescent girls, pregnant and lactating women. SNP being a targeted unconditional direct food transfer programme has the potential to improve nutritional outcomes in the population at scale.

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