SANH Stakeholder Research

Barriers and Challenges to effective Nitrogen Management: Stakeholder Analysis of Agriculture Policies in India

A Summary Document

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Introduction

Nitrogen is an important nutrient in agriculture and food production, yet it's over application poses a serious threat to the environment. Crops absorb only half of the nitrogen that is applied on an average. On consumption, humans and animals utilize only a fraction of it, leaving the rest stored in the soil for a temporary period or lost to the environment (Sutton et al., 2013). These nitrogen losses lead to serious environmental issues like eutrophication, air pollution, and loss of biodiversity- to list a few. Yet, driven by the ever-increasing global food demand, agriculture continues to a dominant source of nitrogen pollution[1]. In the Indian context, the N management policy portfolio has largely been focused on the farm level interventions, with a few policies intermittently enacted to push forward the "organic farming" and "sustainable agriculture" agenda. However, implementing policies at the farm level is a challenge considering many other factors that contribute to Nitrogen pollution in the context of the agri-food supply chain. For instance, actions of the fertilizer production company; food losses on the consumer side; and nitrogen losses at water treatment plants, also contribute to N flows. The challenge is also to balance trade offs in the decisions pertaining to nitrogen management and food productivity at a macro-level.

As part of the policy analysis, considering the diversity of stakeholders and their interests, it was imperative to attempt a nuanced analysis of relevant actors, their interest and influence and assess the feasibility of more focused engagement towards effective nitrogen management. In absence of such an analysis, it was likely that some actors would continue to have greater say while some would remain marginalized. Some of the primary stakeholders who play a role in N management at different stages of the agri-food supply chain include- (i) Farmers, (ii) Government bodies, advisers, extension services, financial organizations, (iii) processing industries (crop goods, dairy, meat, etc.), (iv) retail organizations, and (v) consumers. With the normative underpinning of inclusivity/equity and environmental sustainability in mind, we tried to interact with maximum number of stakeholders, including farmers (those that are practicing organic or mixed kind of agriculture) while simultaneously analyzing policies and discourses.

The broad questions that were asked in this study are:
I. Who are the key stakeholders (with reference to identified policies in 4 key decision areas-namely, fertilizer reforms, crop residue management, organic practices, and livestock feed waste management)?
ii. What are their roles and interests vis-à-vis the policies/sub-sector decisions?
iii. What are the policy positions and how do they influence decisions (or could potentially influence decisions) related to effective nitrogen management?

Methods and Materials

For the purpose of the study, stakeholder analysis was understood as enabling a systematic identification of stakeholders, assessment and comparison of their interests, roles and powers, and the consideration and investigation of the relationships between them, including alliances, collaborations, and inherent conflicts. It examines ''who these interested parties are, who has the power to influence what happens, how these parties interact and based on this information, how they might be able to work more effectively together" (Reed et al., 2009: 1947) to address environmental problems.

[1]Agriculture is the major contributor of ammonia, nitrous oxide to air, nitrites, and nitrates to water (SACEP and SANH 2021).

The approach toward policy and stakeholder analysis was largely qualitative, multi-stage and multi-dimensional (illustrated through Figure 1). This was consistent across the four key sub-sectors for N management in agriculture sector, namely, fertilizer reforms, organic and sustainable practices, crop residue management, and livestock feed and waste management. Multiple sources of data were used including review of key policies, literature review and empirical data collection (using expert interviews, Focused group discussions and in-depth stakeholder interviews). Reliability of data was ensured using data triangulation, which meant data coming from multiple sources were cross checked and validated.

Fig 1 describes the methodological approach and subsequently the methods are briefly described.

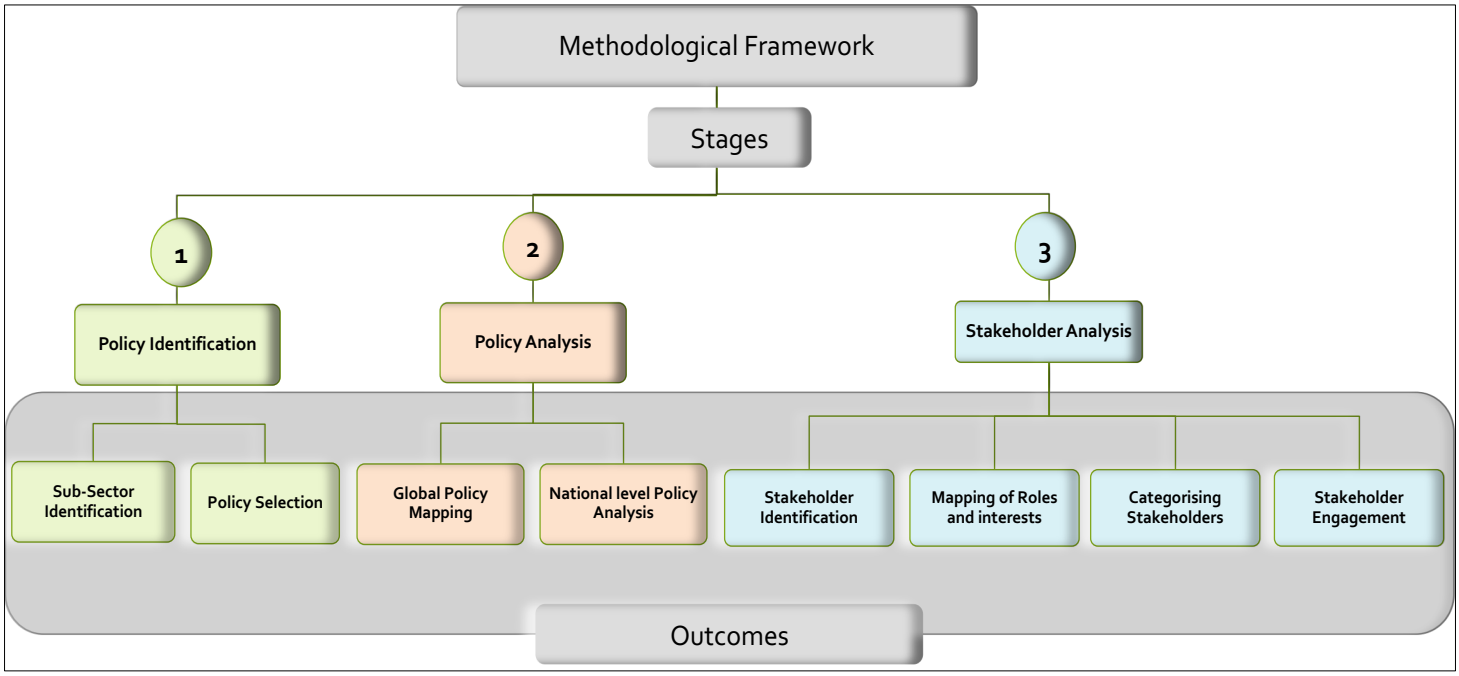

Figure 1. Methodological Framework

Literature review: snapshot

Literature review was a concurrent process in this entire exercise. The main aim of the literature review was to identify key stakeholders, their roles, interests, and influences in key N management decision areas. A total of 75 documents were reviewed including journal paper; reports; case studies; articles; book chapters; guidelines and manuals; conference proceedings; masters and doctoral thesis; working papers; web pages; and technical bulletins. Keyword searches were also carried out in the 17 policy documents.

Stage 1: Policy Identification and Selection

The major sectors for nitrogen management were identified using the Indian Nitrogen Policy Database (which identified 305 national policies) (SANH, 2021). A total of 39 policies were identified based on the contribution of different sectors to nitrogen pollution, including agriculture, waste, transport, land-use change, food security and multiple sectors. The agriculture sector policies were further categorized into sub-sector policies, or key decision areas (which included fertilizer reforms, organic and sustainable practices, crop residue management, and livestock feed and waste management). A total of 17 agriculture policies were shortlisted for further analysis.

Stage 2: Policy Analysis

2a) Global Policy Mapping: Mapping the global nitrogen policy regime was important to understand the shifts in international discourse and to identify the nature of influences on the regional/national policy regime. For this, a database of international nitrogen-related policies was created, which included 17 policy instruments (market mechanisms, regulatory standards, and international declarations). The mapping spans over five decades (1970s to 2021).

2b) National Level Policy Analysis: Content analysis was carried out to understand how the selected agriculture sector policies have evolved to address the demand for integration of Nitrogen management perspectives, and to subsequently analyze the stakeholder dynamics. Content analysis, also known as textual analysis, aids in the evaluation of information contained inside a document by understanding the language used in the text (Bryman, 2016). For instance, to identify whether policies are emphasizing mechanisms to maximize NUE in crops, we used codes like "Nitrogen use efficiency" OR "NUE" OR "fertilizer application" OR "fertilizer use" OR "nitrogen loss" OR "fertilizer requirement assessment" OR "nitrogen emissions" OR "site-specific nutrient management" in NVIVO software to identify relevant text. The identified text was further examined for its context and decisions that were referred to for a clearer understanding of positions taken.

Stage 3: Stakeholder Analysis

Identifying and understanding stakeholders' positions in key decision areas within the agriculture and allied sectors is essential to highlight which actors (state and non-state actors, such as policymakers, farm advisors/experts and extension services, financial organizations as well as research and civil society organizations and international regulatory bodies) are involved either directly or indirectly and/or are likely to have an impact on the outcome of the decision-making process. For the stakeholder analysis, we employed a) literature review, b) policy review through content analysis, c) focus group discussions (FGD), d) expert interview, and d) stakeholder interviews. The stakeholder analysis involved four steps: 1) Stakeholder Identification, 2) Mapping of Stakeholder Interest, 3) Categorizing Stakeholders based on their Interests and Influence, 4) Stakeholder Engagement

Key Findings[2]

1) International Nitrogen Management Policy Regime

The major nitrogen management policy instruments at the global level were mapped to understand the shift in discourses. The 1970s were marked by a global environmental awakening, and the 1990s were marked by international environmental treaties as a result of breakthroughs in air pollution and stratospheric ozone. Despite the existence of numerous UN nitrogen-related organizations and treaties since 1972, global nitrogen waste has tripled in the previous five decades. However, scientific participation in the UNECE Air Convention made significant progress in linking nitrogen issues. While there is still significant fragmentation between research on the various benefits and threats of reactive nitrogen, the recently developed 'International Nitrogen Management System,' (INMS) aims to provide a coherent system to support policy development. There is now a matching challenge to bring together the various nitrogen policy agreements as a foundation to address synergies/trade-offs and set priorities.

2) Key Trends in National Level Fertilizer Reforms in India

[2] In this section we are only giving a snapshot of the findings for -national level policy analysis and stakeholder engagement strategy and findings. The national level discussions presented here are for fertilizer sector reforms.

Major trends in fertilizer sector reforms vis-a-vis intended changes in farming practices can be categorized as follows:

- The 70s-80s: Promotion of fertilizer use in the potential green revolution areas through regulation of sale, pricing and quality of fertilizers, fertilizer subsidies instituted for achieving food security
- The Mid 80s-90s: Policy focused on primary (Macro) nutrients, with few attempts at tackling the nutrient imbalances through customized fertilizers
- The 90s-2000: Efforts made to reduce and rationalize fertilizer subsidies as part of an economic reform agenda to address fiscal, distributional, and environmental concerns
- The 2000s: As a result of over-use of chemical fertilizers and deteriorating soil health in different regions organic farming practices customized fertilizers were introduced, simultaneously government attempted to improve the fertilizer sector's efficiency while maintaining the farmer subsidy in light of the need to increase agribusiness
- 2010-20: Nutrient-based subsidy, promotion of energy-efficient indigenous urea production, prevent diversion of urea for industrial purposes-thus neem coated urea, and simultaneously making organic farming more sustainable and climate-resilient.

3) Stakeholder Categorization (for fertilizer sector reforms)

Adapting the interest-influence matrix from Reed et.al. (2009), we developed 9 categories of stakeholders- Key players, Promoters, Subject, Potential supporters, Latent actors, Marginal actors, Context setters, Low priority, and Crowd. Fig 2 represents the analytical categorization, which is further exemplified using the matrix developed for fertilizer sector reform (See Fig 3).

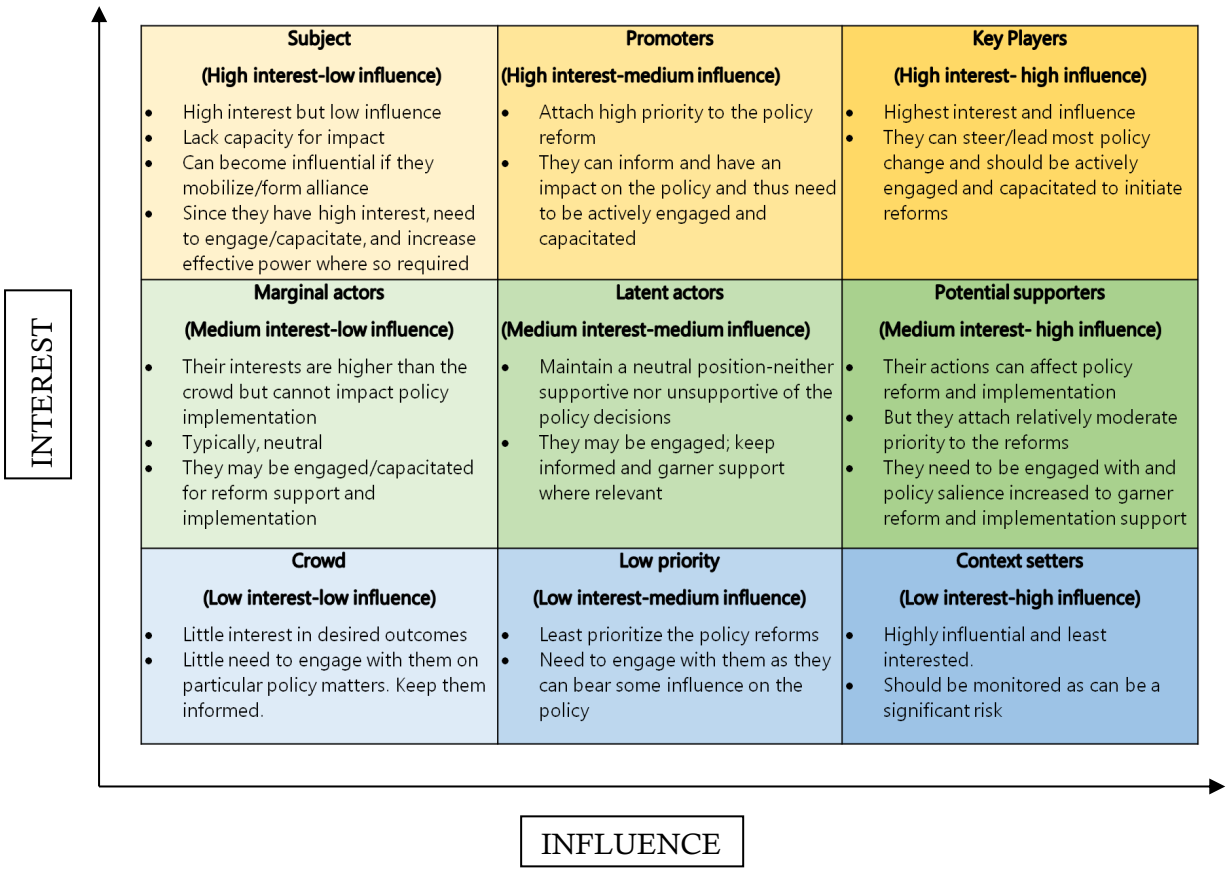

Fig 2: Stakeholder Categorization matrix

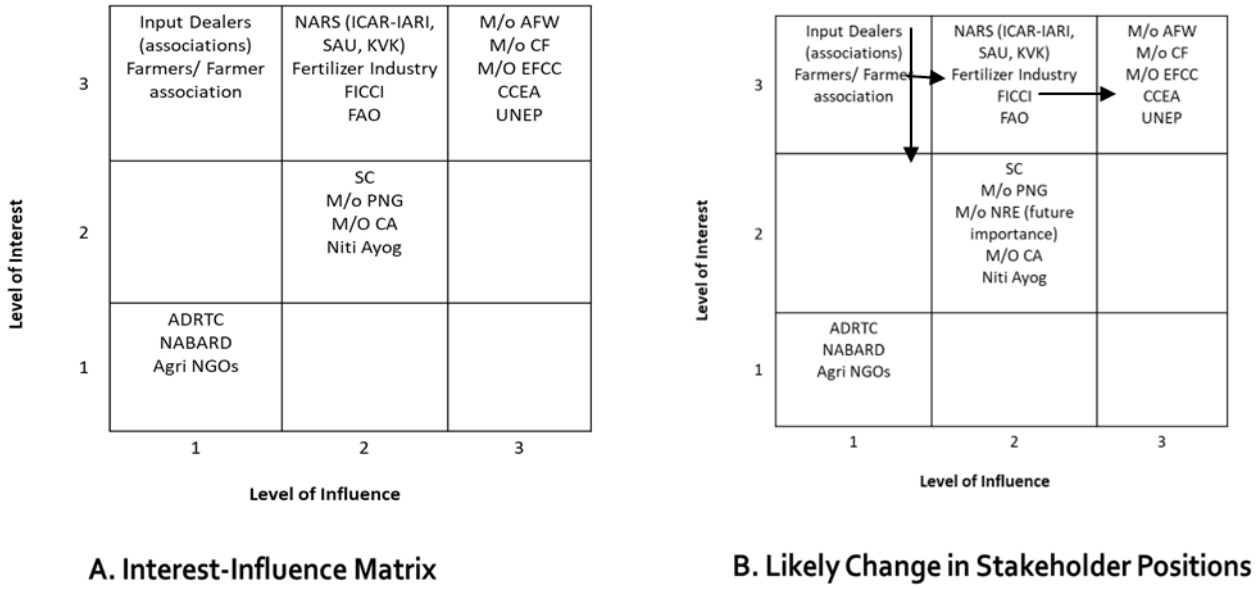

Figure: 3 Stakeholders influencing Fertilizer Sector Reforms in India

The matrix (in Fig 3A) clearly shows the positions of the stakeholders on the Fertlizer reforms, and the likelihood of change in positions in future policies (Fig 3B). Experts perceived changes in the position of input dealers, farmers/ farmer associations and FICCI (the fertilizer industry's indirect lobbying organization) but rest of the positions were perceived to remain the same. The analysis was useful in thinking about the strategy for engagement with various stakeholders in short and long term, depending on what policy reforms are prioritized. Fig 4 illustrates the key actors that can be actively engaged and capacitated to initiate reforms and strengthen implementation.

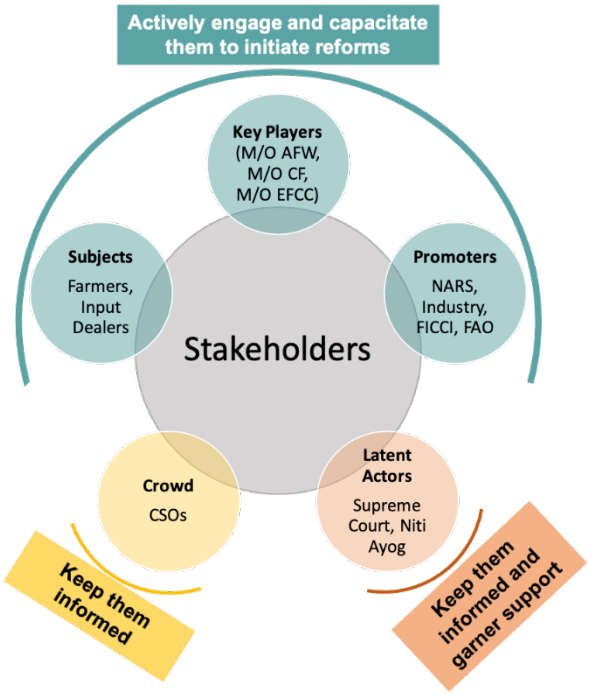

Figure 4. Strategy for Stakeholder Engagement in Fertilizer Sector Reforms

4) Engaging With Stakeholders

Once stakeholders' categories were identified based on their roles, interests and influences, semi-structured interviews were conducted with the key stakeholders to understand their position on N management and their views on the emerging policy issues. A total of 15 Stakeholders from Government Bodies, Industry and Market Actors, Civil Society, and Research Organizations were interviewed. The following table gives the stakeholder profiles and issues/topics discussed.

Table 2: Stakeholder Engagement in understanding N-management issues in Agriculture Sector

Stakeholder Groups	Stakeholder Categories	Issues Discussed	Institution	Respondent Profile
Government Bodies	Key Players	Entry points for policy shift, Fertilizer subsidies, stakeholder importance, policy challenges and solutions	Ministry of Agriculture & Farmers Welfare	Joint Secretary (n=1)
			National Green Tribunal	Judicial Member (n=1)
Research Organization	Promoters	Farming risks and preferences in sustainable shifts, policy measures, role of stakeholders, research and innovation, research organization's roles and constraints in N management	GGS Indraprastha University	Chair, International Nitrogen Initiative & Prof. of Biotechnology (n=1)
			KIIT University	Director, South Asia Nitrogen Centre, & Professor (n=1)
			IARI	Principal Scientist (n=1)
Industry	Promoters	Farmers' adoption rate and preferences, market strategies, fertilizer subsidies and pricing, energy efficiency in production, policy shifts required	Fertilizer Association of India	Director (Agricultural Sciences) (n=1)
			Syngenta Foundation	Agriculture Engineer (n=1)
Non-Government Organizations	Crowd	Fertilizer use trends, interventions, policy implementation constraints at the grassroots, stakeholder roles, challenges in building farmer capacities	Sustainable India Trust	Project Associate (n=1)
			BAIF	Thematic Programme Executives (n=3)
Organic/Mix Farmers	Subjects	Perceptions and risks, crop residue management, enabling policy environment,	Haryana, Uttarakhand	n=8

5) Stakeholder perspectives on policy and practice (broad agriculture)

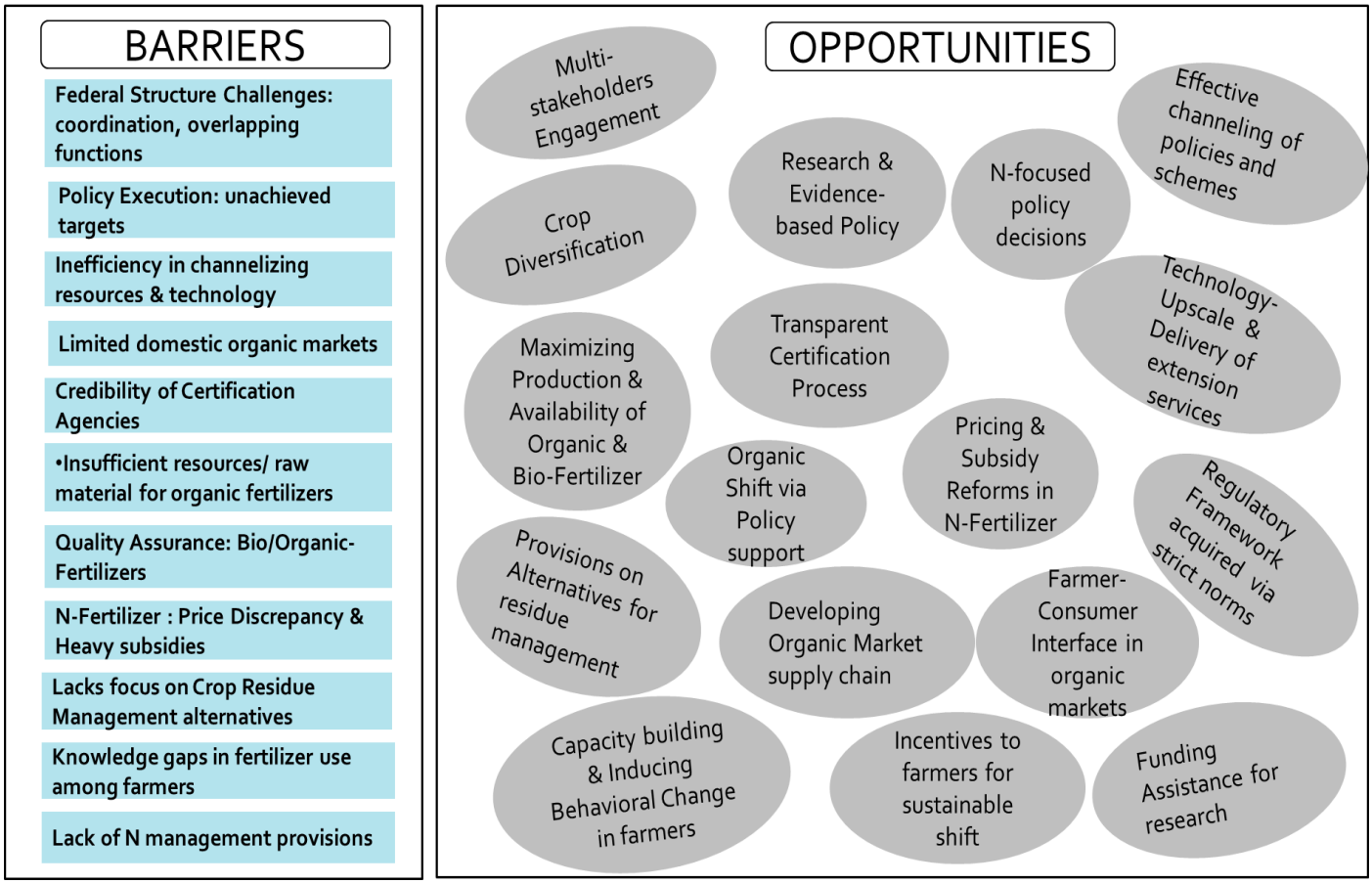

Figure 8: Barriers and Opportunities in N-management

Way Forward:

Carry stakeholder analysis in 2 major polluting sectors in each country of S Asia	• Identify key polluting sectors and sub-sectors • Identify related policies based on nitrogen relevance and impact • Estimated time per sector: 6 months
Identify stakeholders/their roles and interests	• Review of relevant literature • Policy review (manually/use software) • Expert interviews and/or FGDs • Mapping stakeholder roles and interests (with reference to policies/sub-sectors/key decision areas)
Stakeholder categorization to understand their influence on policies	• FGDs/Expert interviews to understand interest and influence of actors • Tentative Tool: Interest-Influence matrix • Analytical categorization of stakeholders • Validation of categories through review of literature/expert consultations • Assess engagement strategy for different categories
Stakeholder engagement	• Identify stakeholders to be interviewed • Conduct semi-structured interviews/stakeholder workshops/FGDs/group interviews etc. (data saturation ideal) • Analyze barriers and opportunities in nitrogen management with reference to identified sectors • Further engage for policy strategizing

References

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2. Sutton, M. A. et al. (ed) Our Nutrient World: The Challenge to Produce more Food and Energy with less Pollution (Centre for Ecology and Hydrology, 2013).
3. Reed, Mark S., et al. "Who's in and why? A typology of stakeholder analysis methods for natural resource management." Journal of environmental management 90.5 (2009): 1933-1949.
4. Bryman, Alan. Social research methods. Oxford university press, 2016.

Annexure 1

List of policies:
A total of 17 policies were selected for further stakeholder identification and analysis
Fertilizer Policies

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2. Guidelines for Production and Use of Customized Fertilizers 2008http://agricoop.nic.in/sites/default/files/Guideline2013.pdf
3. Fertiliser (Control) Order 1985 (*Amended in 2013) http://www.google.com/url?sa=t&rct=j&esrc=s&source=appssearch&uact=8&cd=0&cad=rja&q&sig2=bEBpfcrA2Wa7_fcho2Aqw&ved=0ahUKEwim1dmX2vHmAhWOY10KHeBiAj04ABABKAAwAA&url=http://extwprlegs1.fao.org/docs/texts/ind129935.doc&usg=AOvVaw2VVuSNNC5QGr2v3nsgACYF
4. New Urea Policy 2015 https://fert.nic.in/fertilizer-policy/urea-policypricing-and-administration
5. Policy for encouraging production and availability of fortified and coated urea 2015http://fert.nic.in/sites/default/files/What-is-new/Policy%20for%20encouraging%20production_0.pdf

Broad Based Policies

6. National Mission for Sustainable Agriculture 2010http://www.agricoop.gov.in/sites/default/files/National%20Mission%20For%20Sustainable%20AGRICULTURE-DRAFT-Sept-2010.pdf
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Organic Farming Policies

14. Organic Farming Policy 2005https://ncof.dacnet.nic.in/Policy_and_EFC/Organic_Farming_Policy_2005.pdf
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Crop Residue Management Policies

17. National Policy for Management of Crop Residue 2014http://agricoop.nic.in/sites/default/files/NPMCR_1.pdf