Explaining persistence of subsistence farming as a 'lock- in': *Lessons from the Tanzanian rural poultry industry*

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1. Study concerns and motivation

"The paper is broadly concerned with what constrains innovation in subsistence agriculture, and how the public sector can intervene to promote transformative processes that guarantee inclusive growth."

1. Study concerns and motivation

Why subsistence agriculture which is known to operate at low innovation levels, and offer less gains, still dominates the agriculture sector in sub-Saharan Africa by almost 80 per cent?

1. Study concerns and motivation

Despite over 50yrs of investment in R&D, African agriculture still **lacks the basic inherent capacities for growth**

This happens where:

- *There is knowledge,*
- *Technology is floating around,*
- *There is market for food & raw materials, and*
- *There is both local and international desire to eradicate poverty, and moreover*
- *Nobody wants to be poor,*

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4. Research Objectives and Questions

OBJECTIVE: *To describe, understand and explain innovation behaviours in subsistence based industries, what influences them, and how they can be externally influenced as a system through a public action to meet broad objectives such as poverty reduction.*

QUESTIONS:

Q1. What drives or constrains innovation (in terms of demand and utilization of new knowledge) in the rural poultry industry?

- *Focusing on system structures and actors' behaviours (including perceptions, expectations, routines and interactions)*

Q2. Why is innovation generally low in the rural poultry industry in Tanzania?

- *Why are interactions low? What determines (promotes/limits/blocks) interactions?*
- *What sustains low innovation behaviours (in terms of demand and utilization of new knowledge)?*
- *Why was innovation low despite the growing market demand for poultry products, existence of a large body of poultry innovations (i.e. husbandry practices, technologies, etc.), and the public interest to reduce rural poverty through funding a range of agricultural and poultry development programmes?*

Q3. How can innovation behaviours and structures be influenced towards a shift to higher innovations levels in industries dominated by subsistence producers? *I.e. what support mechanisms, institutional arrangements and configuration of actors are needed?*

2. Study focus

The paper examines innovation structures and processes in rural poultry industry in Tanzania as an attempt to explain what has the potential to sustain low innovation tendencies despite existing market incentives.

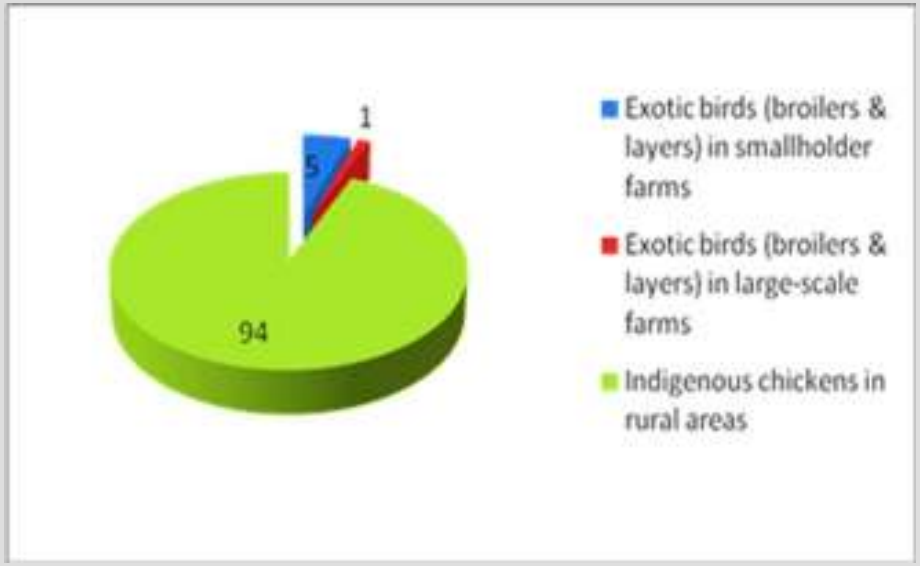
The analysis uses the **Path Dependency Theory (PDT)** to present the observed dominance of the traditional poultry production system as a ***'lock-in'*** i.e. analysing how ***existing 'mental frames'***, '***resource allocation***', and the '***behaviour of dominant powers'*** reinforced low innovation tendencies in the study industry;

And the concepts of ***'organisational thinness'*** and ***'fragmentation'***, also from the PTD to explain how ***promoting self-sufficiency*** in inputs and knowledge locks subsistence producers in low innovation tendencies.

5.Context of investigation

- The empirical data came from interviews carried in Songea and Njombe districts involving poultry producers, input suppliers, extension service providers, etc.
- The data was collected at different times between September 2012 and March 2014 using a variety of ethnographic methods combining observation, focus group discussions, and semi-structure interviews.
- Secondary data from government archives and poultry program databases were also used.

6.The Tanzania rural poultry industry



- Two systems-intensive and extensive (traditional)
- >94% of poultry birds are indigenous kept under traditional system
- >66% of HHs in Tanzania keep indigenous chickens

- Rural chickens satisfy 20% & >98% of the urban & rural demand for eggs and meat respectively.
- 1961 - 1967 - no poultry development policy in Tanzania.
- In 1967 the Government started to regulate the sector with a strong bias towards promoting commercial production of exotic breeds through semi-intensive and intensive production systems in urban and peri-urban areas (Kaijage, 2011).

Public efforts to develop the industry

- Constraints considered have always been:
  - ✓ *Prevalence of diseases,*
  - ✓ *Poor quality feeds,*
  - ✓ *Inadequate technical support services,*
  - ✓ *Low genetic potential of the local breed, and*
  - ✓ *Weak farmer organizations.*

- Hence strategies put forward have always been:
  - ✓ *Use of improved breeds for crossbreeding purposes,*
  - ✓ *Operationalization of programs to control diseases (mainly through extension and vaccination),*
  - ✓ *Promotion for the establishment of low cost breeding strategies*

7. Interrogating subsistence farming

Defining subsistence farming is not straightforward. Because where to draw the line between a ‚subsistence farm' and a ‚market farm' is a matter of judgement ***(Cadot et al, 2010)*.**

However in all attempts to define subsistence production one finds similarities on issues related to:

- *smallness of the market share,*
- *low input use, and*
- *lack of consistent response to market needs and opportunities.*

This means subsistence production **is not driven by market** but rather by household needs, be it food, cash or leisure.

It is also evident from the literature that subsistence producers deliberately choose low-return strategies to manage production risks **(Abele & Frohberg, 2003; Cadot et al., 2010).**

According to **Heidheus and Bruntrup, cited in Abele & Frohberg (eds), (2003; p.2),** Subsistence agriculture is:

- ✓ *closely linked to a **low level of economic development**,*
- ✓ *seen as synonymous with **backwardness and inefficiency**, holding down economic growth and economic performance.*
- ✓ ***mostly found both in today's less developed countries** and in the early stages of industrialized countries.*

Typically, subsistence agriculture is characterized by:

- ✓ *a **low-external input level** and **low productivity** (per land and /or per labour), and*
- ✓ *a general **lack of efficiency of resource use**.*

- In economic terms, subsistence agriculture is argued to:
  - ✓ *be a low production sector, **whose actors seem to behave irrationally** and therefore found to be resistant to change and innovation (ibid).*
  - ✓ *display **low responsiveness to policies** and is therefore difficult to influence through developmental policies* ***(Seavoy, 2000; cited in (Abele & Frohberg (eds), 2003).***

Contrary to the above arguments:

- ✓ *some analysts see subsistence agriculture as a sustainable economic system because of its autarchy* ***(Doppler 1991; in Abele and Frohberg (eds.), 2003)***.
- ✓ *Others see its continuing existence as a proof of efficiency,*
- ✓ *While others see it providing a relief from curses of globalisation and modernisation* **(Abele & Frohberg, 2003).**

These arguments are challenged by **Abele and Frohberg (2003)** that :

- ✓ *Autarchy is prone to production risks that cannot be buffered by functioning markets.*
- ✓ *Moreover, subsistence agriculture yields lower incomes than market-oriented agriculture.*
- ✓ *And since it has been proved that the lower the national income is, the higher is the number of subsistence plots, then it is possible to conclude that subsistence farmers are overall disadvantaged, and that subsistence agriculture is really a problem.*

"Braun and Lohlein (in Abele & Frohberg, 2003) argue that, in a global sense, subsistence production is becoming less and less viable as it misallocates such a significant labour and natural resources to unrealised gains from trade and specialization."

- ✓ **Africa wants to alter the prevalence of subsistence agriculture**
- ✓ **Numerous attempts were previously made but failed,**
- ✓ **Existing literature lacks empirical evidence of how innovation can be promoted in subsistence-based industry to achieve sustainable industry-wide transformation.**
  - *This happens at a time when it is increasingly becoming evident that existing approaches currently used for farmer empowerment and agricultural technology transfer have failed to influence innovation behaviours of a significant number of African rural producers and to gain capacities needed to escape the „subsistence trap" (**Wouter Zant, 2005**).*

- ✓ Factors mentioned in the literature as causes of persisting subsistence based agriculture **<u>are mostly external to the producer</u>**.
- ✓ Very little is mentioned on internal dynamics surrounding the decision-making processes within such a household. This includes the role played by the continued exclusion of such a household from interacting with non-subsisting producers or actors in the same industry or production system in manners that challenge behavioural status quos.
- ✓ Where the external causes are mentioned, very little is mentioned about the institutional and cognitive factors causing them.

- Literature explains that high poverty levels which cause low affordability of inputs and services, high transactions costs, poor access to markets, poor infrastructure and high risk nature of agriculture in such countries are the major barriers to exit subsistence production (Cadot et al., 2010; P. Pingali et al., 2005; Shepherd, 2006; Zant, 2012).
- Wouter Zant explains that these factors reinforce each other to create what he called ***'a subsistence trap'*** where it becomes even harder to exit (Zant, 2012).
- But these explanations do not explain why a large number of producers would commercialize other commodities like coffee, cotton, maize, etc., but consistently choose to keep poultry as a subsistence activity despite the growing demand for poultry meat and eggs.

- Therefore this study departs from the premise that rural producers operate within complex smallholder production systems which constitute a myriad of possibilities to provide for their livelihood needs which tend to influence production decisions in a very complex way.
- This makes reasons for the persistence of subsistence tendencies equally vast and complex, such that it is difficult to identify a small number of factors to explain it.
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- Therefore, in the light of **path dependence theory** ,and specifically the concepts of 'lock-in, this study integrates various explanations provided by the literature to describe the persistence of subsistence (low innovation) tendencies in rural poultry.

8.Path Dependency Theory (PTD)

- **Path-Dependency Theory (PDT)** emerged in the 1980s to counter neoclassical assumptions about the reversibility of economic decisions **(Nelson and Winter, 1982; Magnusson and Ottosson, 1997).**
- It is frequently used to analyse trends in innovation **(Patel and Pavitt, 1997; Coombes and Hull, 1998),**
- the theory is best known for the notion of '**lock-in**' which argues that: *'technology or technological regime may be quite flexible when it first develops, but over time steadily more fixed pathways become established. '*

In agricultural research, path dependence and lock-in have been used to study the adoption of pest-control strategies (Cowan & Gunby, 1996; Ugaglia et al., 2011; Wolff & Recke, 2000) where chemical crop protection (CCP) and the integrated pest management (IPM) were treated as competing technologies.

In this study, the traditional and the commercial poultry production systems are treated as competing trajectories, then established why the traditional system dominates in rural Tanzania.

It analyses the lock-in from:

- ✓ **assessing actors' behaviours**, by examining existence of three types of lock in, (i) **the cognitive**, (ii) **structural**, and (iii) **political lock-in**. And

- ✓ **assessing systems structures'** by studying interactions (extent and type) in the industry as a proxy for innovation. The use the concepts of "**organizational thinness**" and "**fragmentation**" to explain why interactions are low.

- PDT assumes that different pathways could have been taken (i.e. there is no single equilibrium), thus highlighting the influence of (possibly minor) historical events on the emergence of a particular pathway **(Ruttan, 1996; Hogg, 2001)**.
- *Once one option gained advantage (i.e. market share), other factors provided positive feedback to reinforce its pathway. These factors can include:* ***capital or learning investments*** *sunk in one option, which inhibit change;* ***increasing returns to scale*** *or information, which reward dominance;* ***network externalities****, when interests of different actors converge on an option; and familiarity, which* ***reduces risks from uncertainty*** ***(David, 1985; Wolff and Recke, 2000).***
- Besides such structural factors, a pathway may also be reinforced by **norms or routines** associated with a particular technological regime **(Dosi, 1984; Coombes and Hull, 1998)**.
- Thus, while choices are rarely completely fixed, innovation often follows established pathways due to the cost of changing pathways, or because the norms or routines of a technological regime **preclude alternative approaches from being considered**.
- The literature on path-dependency therefore, emphasises system-level analysis, focusing on technological regimes **(Berkhout, 2002).**
- Analysing the rural poultry industry with such a broad, historical perspective is uncovered other factors for low innovation tendencies in rural poultry production besides producers‘ poor resource base or lack of production skills and technologies.

Path dependency basically refers to processes or systems whose outcome evolves as a consequence of the process‘ or system‘s history **(Martin and Sunley, 2006, p. 399).**

- ✓ *While path dependency denotes a more general view of systemic characteristics, three particular concepts have emerged from the path dependency literature, i.e.*
- ✓ *organisational thinness,*
- ✓ *fragmentation, and*
- ✓ *(negative) lock-in* ***(Grabher, 1993, Isaksen, 2001, Asheim et al., 2003, Martin and Sunley, 2006)***.

These concepts emerged because of their relatedness to particular problem regions such as:

- ✓ *peripheral regions (organisational thinness),*
- ✓ *metropolitan regions (fragmentation), and*
- ✓ *old industrial regions (lock-in)* **(Isaksen, 2001, Tö dtling and Trippl, 2005).**

‘Organisational thinness refers to a scarcity of relevant actors (key organisations, firms and institutions) which possess resources that can facilitate innovation activities (Todtling and Trippl, 2005).’

In this study, the PTD‘s concepts of lock-in, organizational thinness and fragmentation are used to analyze:

- ✓ *the intensity of different actors within the rural poultry industry (as the AIS under study),*
- ✓ *their individual and collective behaviours, and how they interact.*
- ✓ *The information is then used to establish how the outcome and evolution of these factors are a consequence of the industry‘s history.*

- The path dependence theory provides a theoretical concept for **analysing the competition between two paradigms** and explains what makes one dominate over the other (Wolff & Recke, 2000).
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- The theory also explains if dynamic increasing returns exist, a path once chosen will become entrenched (Colombelli & Von Tunzelmann, 2010; David, 2000; Niosi, 2011; Ruttan, 1997).
- Thus building on the argument that there is a **technological dimension** of development paths (Dosi 1982) and **organizational arrangements** which tend to persist for a long time (Kogut 1991),
- So in this study the theory is used to examine both organizational and technological reasons for the traditional (extensive) poultry production system to persist over commercialisation (semi-intensive or intensive system) despite the known benefits and superiority of the later in reducing poverty.

Path dependence embodies a strong prescription about which **direction of technological change** should be pursued and which should be neglected **(Schienstock, 2004).**

In addition, Hamalainen introduces the idea of **mental paradigms** which are shared by most economic actors in a system and which create path dependence.

Hamalainen argues that there tend to be **internally consistent and shared mental sets‘** which result from *prevailing norms*, *values* and *policies* continuously reinforced by the positive experiences and feedback stemming from the evolutionary phases of *technological*, *organisational* and *institutional* development **(Schienstock, 2004).**

‘Therefore, examining the presence of these mental sets provides an explanation of why certain development paths stick more than others.’

The analysis, specifically pays attention to the dual production systems found in the poultry industry in Tanzania;

a) *the intensive or (semi-intensive) commercial production system mostly found in urban areas and which is well integrated in the poultry input and output markets, and*
b) *the extensive traditional*

- System which is predominantly rural and which is more ***socially embedded***, and which has ***no links with input markets***.
- The two systems were considered to be technologies in the sense that each of them embodies a specific breed which is linked to specific management routines and technologies. For example, in the commercial system producers keep patented pure breeds of broilers and layers which are regarded as improved technologies resulted from systematic genetic selection and manipulation or different crossbreeds.
- In addition, the commercial system also uses a specific technology package of vaccines, feeds (sometimes fortified with enzymes, vitamins, minerals and other additives), industrially hatched chicks, biosafety measures and other management practices.
- Basically, the two poultry production systems as composite technologies' where multiple technologies are amalgamated and constructed to function as a package. Additionally, I have treated the two production systems as competing technologies in the context of poverty eradication, where the commercial system is argued to provide more benefits in terms of increasing opportunity for learning, productivity and income gains.

['… an old technology, but also a traditional organization model locks a national economy into an inferior option of development and may in the long run result in a loss of competitiveness and the retarding of economic growth' **(Castells, 1997; cited in Schienstock, 2004; p.xx).]**

Literature, identifies three types of lock-in:

1. **'Structural lock-in':** *which exists when most resources are bound to a specific technology and existing organisational and institutional settings are tied to this technology, leaving no room for diversification and the development of new technological paths*;

2. **'Political lock-in':** *which exists when the dominating power structures have a vested interest in the dominant techno-organisational path and resist changes; and*

3. **'Cognitive lock-in':** *which exists if economic actors, continue to adhere to the existing development path, even if it can no longer ensure competitiveness and economic growth* **(Grabher, 1993; cited in Schienstock, 2004).**

Example of negative self-reinforcement:

- ✓ The reliance on natural breeding hinders scalability and that growth in such a system is not assured without introducing an external source of chicks.
- ✓ The analysis also highlights that production in the traditional system is socially driven thus limiting its market structures. For example, pricing mechanisms are socially determined and less directed towards profit oriented production.
- ✓ Reliance on social sources of foundation stock and husbandry knowledge makes the community **self-sufficient** thus locking it within the limits of its own abilities and means.
- ✓ the tendency to allocate fewer resources for poultry makes switching difficult, and any attempt to push for more resources to be allocated needs to either introduce a new source of such resources or facilitate reorganization of existing household priorities, which is in itself a very complex

The study elaborates further that:

- Certain ‚**mental frames**' and **'cognitive paradigms'** exist based on scientific findings regarding the low genetic potentials of local breeds, and society's desire to feel self-sufficient in knowledge and inputs.
- Such mental frames are found to play a significant role in shaping the current innovation behaviours in the industry, including those of researchers and policy makers.
- The research findings have created a bias against use of certain technologies and innovation.
- The study therefore emphasizes that exploring the role played by such factors when analysing innovation in smallholder agriculture is paramount.
- High transaction costs were also found to cause the ‚lock-in' because in rural areas poultry is considered a subsistence

FAO further writes:

....That this does not exclude the introduction of **appropriate** new technologies, and which **should not be sophisticated.** I quote

["…. However, technologies involving substantially increased inputs, particularly if they are expensive (such as imported concentrate feeds or genetic material) should be avoided. This is not to say that such technologies do not have a place in the large-scale commercial sector, where their use is largely determined by economic considerations."]

The pro-poor Catch-22

Like most poultry development specialists, FAO (2004) writes:

["if production from family poultry is to remain sustainable, it must continue to emphasize the use of family labour, adapted breeds and better management of stock health and local feed resources."]

In other words it should continue to operate under low-input-low-output system.

9: Conclusions

1. Promote interactions: *between 'rural enterprise agencies' and other agencies in the urban. Do not support rural actors in isolation*

2. Encourage processes that reduce self-sufficiency in inputs and knowledge: I.e. *push subsistence producers to demand from others. .*

3. Re think self-sufficiency and diversification in rural production: *to avoid spreading resource too thinly.*

4. Deliberately unlock rural producers from subsistence production: *I.e. invest in making them fit-for market.*

5. Met the social cost of building networks: *The poor producers are not attractive for partnerships until they were upgraded. Someone has to pay for the upgrading.*

3. Inducing system shocks to initiate multiple processes: *Interactions and learning evolves from needs and expectation. The status quo in industries dominated by poor producers is insufficient to initiate transformative innovation processes*

Thank you