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ICT for risk mitigation of open to sky livelihoods

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ABSTRACT

Small and Marginal Fisher-folk, Farmers, Livestock owners need optimal information from the sky, ground and from the surrounding environment at the right time from the right source to move up the curve of Income Generation. Most support they seek is not in the form of money or assets but a little knowledge to make a decision which could help them cope with a situation and prevent them from thinking of the inevitable on their fight to balance their walk on the tight rope of the livelihood chosen by them. To minimize arbitrage out of time difference, not for profit programs aim to cover a maximum number of homogenous farmers/fisher-folk lateral literates using Information Communication Technology (ICT). They also have a toll free helpline number which gives them assurance of the existence of the users. A potential user of information immediately confirms the customized content in conversation with an expert to confirm the content of the voice message and also to understand better over a dialogue in his own language. Many other users learn from such peer who has confirmed it with an expert. We see that this kind of Attention Economy, which uses ICT, depends on Persuasion Technology (E.g. A voice message requires a text follow up and then many times conversation with a human expert in users own language then alone he uses (adopts) the information delivered). In this given scenario we may measure the value of information by the amount of risk reduced.

Keywords— Risk mitigation, Persuasion technology, Attention economy, EVPI, ICT4D, Helpline agents, Locale specific content, lateral literates

1. INTRODUCTION

Human societies world over have developed experiences and explanations relating to the environments they live in. They encompass arrays of information, understandings and interpretations that guide them in traditional and customary practices of agriculture and animal husbandry; fishing; fight against disease and injury; explanation of natural phenomena; and strategies to cope with fluctuating environments. People who depend on open to sky rural livelihoods have usually received little formal education, but acquire knowledge by customary practice, trial-and-error and largely by direct field experience. They learn from the social and cultural group they live with. The word of mouth system of sharing information is mostly in vogue generating undocumented local, traditional, indigenous knowledge. In these given circumstance solutions provided by the local shopkeeper or worse still, a frozen situation of “don’t know what to do” has a substitute in the form of information on some ICT platform or a conversation with an Agent leads to heavy risk reduction. These lateral literates, therefore, require such a Non-Standard Solution.

2. AGENT INTELLIGENTSIA

A Non-Standard Solution in vogue is using a slew of knowledge agents who breakdown information and creative interpretation in regional language. These agents are mainstream educated (schools, universities, research institutes) agricultural or any relevant experts. The knowledge that is circulated through the network of professionals, institutions and publications are acquired and then converted to non-scientific jargon-free format translated in regional language and provided to the question that is asked over the helpline. Most time the agents concur what they hear and what they have learnt with cross-questions. All this interaction is completed within 5 minutes and the most suitable solution is decoded and provided to the potential user. The user, in turn, writes down, or memorizes what (s) he hears or sometimes records it on his phone. Many-a-times they call back to confirm or request the same as a play back recording. This is the point where the information gains currency. This user is now converted from potential user to contributor to the Attention Economy.

3. ATTENTION ECONOMY

Before the information can be acted upon, it may have to be interpreted to reveal meaningful patterns and relationships, so as to be able to facilitate decision-making. The NGO programme has a humongous task of touching lives, to provide solutions on a day to day basis ranging from Animal welfare to Bio-pesticides to catch location at sea... Water level and Youth job opportunities to

Zinc composition - a complete range of possibilities. Organizations hire these Agents/Experts/middlemen to operate in this niche segment of development sector, which shares these experiences and explanations onto various technological platforms. According to digital culture expert Kevin Kelly [9] "The modern attention economy is where the consumer product costs virtually nothing to reproduce but supplier of the product has the problem of adding valuable intangibles that cannot be reproduced at any cost." There are a few intangibles that these Experts add and they are irreproducible:

- (a) **Immediacy:** Reaching in Time
- (b) **Personalization:** tailored just for you
- (c) **Interpretation:** Easy to understand and error-free
- (d) **Authenticity:** Validated Source Identity
- (e) **Accessibility:** wherever, whenever
- (f) **Embodiment:** Live on TV or Live on Phone
- (g) **Patronage:** "paying simply because it feels good",
- (h) **Find-ability:** "When there are millions of books, millions of applications, millions of everything which has to understand with focused attention and most of it free, being explained in your language in the most understandable jargon-free nonscientific form makes it findable.



Fig. 1: NGO programmes

That means the Effectiveness of these NGO programmes lies in the ICT content's timeliness, relevance, clarity, credibility, and accuracy lastly as value adds to knowledge. The Agent/Expert/Intermediary hence provide this social attention and these mass voice or videos messages garner collective attention. This is possible only by using various ICT for development platforms.

Table 1: ICT platforms in the development sector

NGO's working on ICT4D India as of 2018	No. of organizations in operation	Potential %age
Traditional Face to Face Using PA System	14	7.8
Radio	22	12.2
Television	18	10
Traditional Face to Face with Text SMS only	27	15
Traditional Face to Face with Voice SMS only	36	19.9
Helpline – Toll Free Number	29	16.1
Recorded Videos on non-relay platforms	7	3.9
Hybrid 1 Public Adrs System + Text SMS	12	6.7
Hybrid 2 Text SMS + Voice SMS	11	6.1
Hybrid Multiple Tech One - One and One – Many	1	0.6
Artificial Intelligence/Augmented Reality/Virtual Reality (AI/AR/VR) Drones	4	2.3
Total	181	100.6
Primary Source: Compiled from various websites on ICT4D 2014 – 2019		

ICT for development includes many types of infrastructure and services, ranging from telecommunications (voice, data, and media) internet, touch screen kiosks, Agri-clinics, private kiosks, social media android mobiles, Mass Media Television, Common Service Centre, Kisan Call Centre, and integrated platforms in the departmental offices with physical outreach using Pico-projectors and hand held devices.

Of these - Mobile telephony (with or without internet) turns out to be the most potent tool of agricultural extension. Voice communication has the fastest acceptability as lateral literates or those who have never been to school also found it easy to accept. This led to the proportion of mobile phone subscriptions increase in developing countries from 30 % of the world in 2000 to over 80 % in 2015 of which 27 per cent are smart phones according to Pew Research Centre study. In India, the Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India launched Kisan Call Centre in 2004.

5. CALL HANDLING BY FARM TELE-ADVISORS (FTAS) AT KISAN CALL CENTRES (KCC)

Kisan Call Centre (1) agents known as Farm Tele Advisor, are graduates or above (i.e. PG or Doctorate) in Agriculture or allied (Horticulture, Animal Husbandry, Fisheries, Poultry, Bee-keeping, Sericulture, Aquaculture, Agricultural Engineering, Agricultural Marketing, Biotechnology, Home Science etc.) and possess excellent communication skills in respective local language. KCC services are managed from 14 locations - Ahmedabad, Bengaluru, Bhubaneswar, Chandigarh, Coimbatore, Guwahati, Hyderabad, Jammu, Jaipur, Jabalpur, Kanpur, Kolkata, Patna and Pune. All KCC locations are accessible by dialing a single nation-wide toll-free number 1800-180-1551 through landline as well as mobile of all telecom networks from 6.00 a.m. to 10.00 p.m. on all 7 days a week including holidays. Iffco Kissan Sanchar Limited (IKSL) from 2014 runs this call centre and has also provided the Agents.

They cover 63% of rain fed farmers) approximately 8.33 Crores (833 million) as of 2018 (source IKSL) which is the largest reach of an ICT programme. Their helpline has responded 12 lakh queries in the last 2 years.

Table 2: Kisan Call Centre Landed Calls Statistics for years 2014-15 and 2016 -17

S no.	States/UTs	Rural Population	KCC Calls Registered		% Change	Calls per Lakh Rural Population	
		2011, '000'	2014-15	2016 -17		2014-15	2016 -17
1	A and N Islands	244	40	424	9.6	16	173
2	Andhra Pradesh	56312	223929	349908	0.57	398	621
3	Arunachal Pradesh	1069	459	987	1.16	43	92
4	Assam	26781	43204	37017	-0.15	161	138
5	Bihar	92075	138198	241698	0.75	150	263
6	Chhattisgarh	19604	61378	59182	-0.04	313	302
8	Delhi	419	33139	32044	-0.04	7903	7642
9	Goa, Daman and Diu	612	109	286	1.63	18	52
10	Gujarat Dadra and Nagar Haveli	34671	245713	233097	-0.06	709	672
11	Haryana and Chandigarh	16531	240654	317924	0.33	1456	1923
12	Himachal Pradesh	6168	75298	64003	-0.16	1221	1038
13	Jammu and Kashmir	9135	108654	84468	-0.23	1189	925
14	Jharkhand	25037	41571	28958	-0.31	166	116
15	Karnataka	37553	249976	288608	0.16	666	769
16	Kerala	17456	28181	22011	-0.22	161	126
17	Lakshadweep	14	11	4	-0.64	78	28
18	Madhya Pradesh	52538	417643	578275	0.39	795	1101
19	Maharashtra	61545	598443	770757	0.29	972	1252
20	Manipur	1900	1762	1883	0.07	93	99
21	Meghalaya	2369	791	1329	0.69	33	56
22	Mizoram	529	364	105	-0.72	69	20
23	Nagaland	1407	345	309	-0.11	25	22
24	Odisha	34951	252649	351098	0.39	723	1005
25	Punjab	17317	287731	273523	-0.05	1662	1580
26	Rajasthan	51540	408322	685490	0.68	792	1330
27	Sikkim	456	2667	1058	-0.61	585	232
28	Tamil Nadu and Pondicherry	37584	222972	273947	0.23	593	737
29	Telangana	21395	2246	734	-0.68	345	303
29	Tripura	2710	4418	5297	0.2	163	195
30	Uttar Pradesh	155111	753842	1273762	0.69	486	821
31	Uttarakhand	7026	46132	38938	-0.16	657	554
32	West Bengal	62214	306992	131472	-0.58	493	211
	India	833088	4795596	6149367			

Source: Kisan Knowledge Management System and Directorate of Economics and Statistics, Ministry of Agriculture, New Delhi and India stat.

The FTAs, are considered as Level 1 (L1) support of KCC. From 2014 IKSL has added 376 more and runs KCC. They have the largest number of Agents in India nearly 600 as of date. Replies to the farmers' queries are given in 22 local languages.

The Level-II consists of Subject Matter Expert (SME). In case the FTAs are unable to answer the questions, they escalate the call to the relevant SME. These members are ~ 3000 officers and experts from the Government of India (Department of Agriculture and Cooperation (DAC), Indian Council of Agricultural Research (ICAR), Department of Animal Husbandry, Dairying and Fisheries (DAHDF), India Meteorology Department (IMD), Indian National Center for Ocean Information Services (INCOIS), Central Warehousing Corporation (CWC) and State Governments and its organizations down to Block level, State Agricultural Universities (SAU) and Agro-Meteorological Field Units (AMFU) who have been activated and are using the Portal and are all located in their own offices. All of them speak the subject in the local language of their region. The general perception is that people who have access to ICT will benefit from it, and those who don't run the risk of being marginalized and bypassed. They have only the local shopkeeper who sells chemicals and pesticides to give advice. They discuss with their village elders too. But then the information would not have weather-based advisory or details of government schemes and regular updates.

6. RISK OF BEING MARGINALIZED AND BYPASSED DUE TO LACK OF INFORMATION

Table 3: Risk tabulation when lacking information

	Problem	Alternatives	Outcomes
Certainty	Known	Known	Known
Risk	Known	Known	Probability Known
Uncertainty	Known	Known	Unknown

In a study by IIMA in 2018 (6) with 100 farmers show that on an average a user made 30 calls per year to the KCC. The study reports that about 97 per cent of the farmers, find the KCC useful, and want it to continue despite its weaknesses, which may be on the quality of content or the market and price information or any other specific. The value of information arrives as and when it is interpreted in the case of weather, prices and government schemes. Then risk outcomes become Probably Known. Let us see what is then the expected value of information, which leads to an informed decision.

7. DECISION UNDER UNCERTAINTY USING INFORMATION SOURCED FROM ICT

7.1 Scenario 1

Take the example of attack of Army ball worm on cotton. The leaves yellow in this case not due to Nitrogen deficiency but require pesticide. In this case, let us take the monetary value INR 500 and 70% favorable advisor

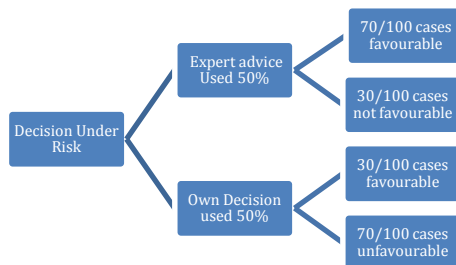


Fig. 2: Advisories for Cotton Leaves Yellowing

$$\text{Advisor decision used} = \frac{(0.70) \cdot (0.50)}{(0.70) \cdot (0.50) + (0.30) \cdot (0.50)} = \frac{0.35}{0.5} = 0.7$$

$$\text{Own decision used} = \frac{(0.30) \cdot (0.50)}{(0.70) \cdot (0.50) + (0.30) \cdot (0.50)} = \frac{0.15}{0.5} = 0.3$$

Expected Monetary Value (EMV) if the cost of the activity is INR 500

EMV With information $500 * .7 = 350$ INR

EMV Without information $500 * .3 = 150$ INR

Expected value with perfect information EVPI with = $350(0.5) + 0(.5) = 175$ INR

Expected value without perfect information EVPI without = $0(0.5) + 150(0.5) = 75$ INR

EVPI optimal = 175 – 75 = 100 INR. Since the EVPI is positive we can go with the advisories.

7.2 Scenario 2

Price information available but could not avoid arbitrage by competitors monetary value INR 500 and 40% favorable advisor.

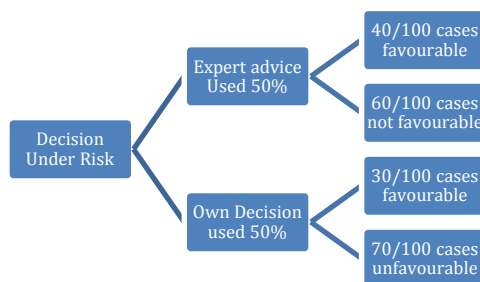


Fig. 3: Market Price Information and facing Arbitrage due to the time lag

$$\text{Decision used} = \frac{(0.40) \cdot (0.50)}{(0.40) \cdot (0.50) + (0.60) \cdot (0.50)} = \frac{0.2}{0.2 + 0.3} = 0.40$$

$$\text{Own decision used} = \frac{(0.30) \cdot (0.50)}{(0.70) \cdot (0.50) + (0.30) \cdot (0.50)} = \frac{0.15}{0.15 + 0.35} = 0.30$$

Expected Monetary value if the cost of the activity is INR 500

EMV With information: $500 * 0.4 = 200$ INR

EMV Without information: $500 * 0.30 = 150$ INR

Expected value with perfect information EVPI with= $200(0.5) + 0(.5) = 100$ INR

Expected value without perfect information EVPI without = $0(0.5) + 150(0.5) = 75$ INR

EVPI optimal = 100 – 75 = 25 INR since the EVPI is still positive we can go with the advice.

7.3 Scenario 3

Weather information delayed rains and hence purchase of water monetary value INR 500 and 20% favourable advisor

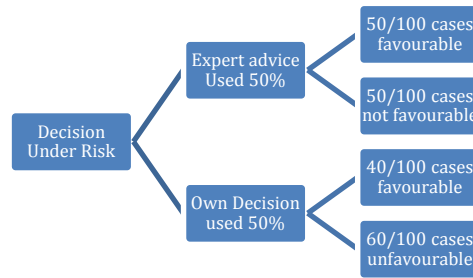


Fig. 4: Rain Delay and Decision to buy or not buy water

$$\text{Decision used} = \frac{(0.50) \cdot (0.50)}{(0.50) \cdot (0.50) + (0.50) \cdot (0.50)} = \frac{0.25}{0.25 + 0.25} = 0.5$$

$$\text{Own decision used} = \frac{(0.40) \cdot (0.50)}{(0.40) \cdot (0.50) + (0.60) \cdot (0.50)} = \frac{0.2}{0.2 + 0.3} = 0.4$$

Expected Monetary value if the cost of the activity is INR 500

EMV With information $500 * 0.5 = 250$ INR

EMV Without information $500 * 0.4 = 200$ INR

Expected value with perfect information EVPI with = $250(0.5) + 0(.5) = 125$ INR

Expected value without perfect information EVPI without = $0(0.5) + 200(0.5) = 100$ INR

EVPI optimal = 125 – 100 = 25 INR since the EVPI is positive we can go with the advice.

7.4 Scenario 4

Livestock owner does not get calves. He takes artificial insemination for his cow for monetary value INR 500 and 10% favourable advisor. There is a special case of Free Martin cattle, which will not have both next generation and milk if it is a female of the male-female twins born. In case of same-sex twins no such issue.

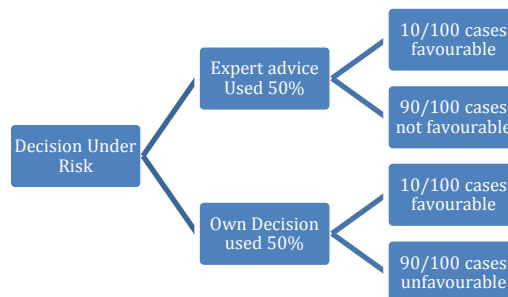


Fig. 5: Case of free martin and knowledge after the calf is grown into a heifer

$$\text{Decision used} = \frac{(0.10) \cdot (0.50)}{(0.10) \cdot (0.50) + (0.90) \cdot (0.50)} = \frac{0.05}{0.05 + 0.45} = 0.1$$

$$\text{Own decision used} = \frac{(0.10) \cdot (0.50)}{(0.10) \cdot (0.50) + (0.90) \cdot (0.50)} = \frac{0.05}{0.05 + 0.45} = 0.1$$

Expected Monetary value if the cost of the activity is INR 500

EMV With information $500 * 0.1 = 50$ INR

EMV Without information $500 * 0.1 = 50$ INR

Expected value with perfect information EVPI with = $50(0.5) + 0(.5) = 25$ INR

Expected value without perfect information EVPI without = $0(0.5) + 50(0.5) = 25$ INR

EVPI optimal = $25 - 25 = 0$ INR Since the EVPI is zero the artificial insemination need not have been done without checking for freemartin case Either ways the cow has to be sold to market.

These computations show that with the least possible chance of a person using the information provided by an expert the person would gain only positive monetary value. Hence the farmer may choose using the content provided without any doubt. Risk can be mitigated even if there is insufficient information. The only necessary condition to the farmers, fisher-folk and Livestock owners is to buy mobile phones in order to access information.

8. CONCLUSION

The Risk that farmers/livestock owners/ fisher-folk should manage is:

- Avoid own decision on various aspects of farming (pricing, government schemes)
- It may be insufficient but still, prefer advisories as the discussion will reduce errors of self-decision
- Uncertainty due to weather has to be first eliminated. It is mandatory for a confirmed and affirmed the decision.

The Risk that agents should manage:

- Every information should be shared by the agent to convert decision into an experience
- Advisors may not be open to sky operators but then their academic input if constantly evaluated for recent updates becomes information with value.
- Government schemes Information should be checked for validity in all possible context in order to avoid giving unnecessary hopes as each scheme may not suitable to all (Shepherd insurance only for that group, Girl child of fisher-folk free education etc.)
- The agent should practice discerning questions, and create an index of such questions to ask the caller within those 5 minutes of conversation.

Traditional network technologies when combined with data availability, the right enabling environment, can unleash the tremendous innovation potential of the agriculture sector responsibly (FAO and ITU 2016) (8). ICT helps avoid arbitrage arising out of delays in access to information. In India ICT devices range from radio, television, telephone and mobile, satellites etc. to more sophisticated and emerging technologies like smartphone applications, multimedia messaging platforms like Whatsapp, drones, block-chain, Machine to Machine, Internet of Things, Cloud computing, Big Data and data analytics. Any and all must have a human interface of an Agent for a conversation on the content in the local language.

This EVPI calculation when we run it for every probability zero to 100 in all permutation combinations of own decision and agent's information for the decision, we will find some important conclusions as below:

- Some minimal amount has to be spent for the information to get a value.
- The probability of going in for own decision against agent's information is binary (50:50) by the study as it is human psychology. This has due to Perpetual Technology increased in reality to over 60 % as confirmed by most of the studies conducted in India on ICT based development.
- The attention economy requires ICT or rather ICT 4 D actually moves attention economy up the learning curve.
- There exists a risk or a negative extreme where people may become completely dependent on information for even small decisions.
- Any information could become truth or fact with Persuasion Technology. So we should be careful to see to it that these agents are all qualified, they use only scientifically proven information and should not create biases in the chemicals and fertilizers market.

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